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HEPATICAE OF NORTH AMERICA

PART III

By

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Hepaticae of North America

PART III

LOPHOZIOIDEAE¹

Plants green to brownish or reddish to blackish. Stems 0.2-10 cm long, usually with some branching, branches in many of them from the ventral half of the leaf axil. Rhizoids in tufts or scattered. Leaves alternate, transversely to quite succubously inserted, those of the middle region of the sterile shoots simply 2-5-lobed but in occasional species some of the leaves entire; margins entire to somewhat toothed or ciliate, their cells much like the interior ones; lobes often fewer near base of a shoot than near middle, often increasing in number near the female bracts, the halves of the leaves equal or the ventral half tending to be the larger; sinus 0- $\frac{2}{3}$ the leaf length. Cells with walls thin or thick; trigones from wanting to bulging. Underleaves from wanting to present throughout. Plants mostly unisexual but a few bisexual; both inflorescences on normal leafy shoots, the female one sometimes on a lateral branch but never on a ventral one. Female bracts in nearly all species free from each other; bracteole present with rare exceptions. Perianth free from the bracts in almost all species. Perigynium wanting, except in *Acrobolbus*. Seta largely unknown as to structure. Sporangium spherical to oblong-ovoid, with straight valves; wall of sporangium 2-6 cells thick so far as known; epidermal wall layer so far as known with nodular or semiannular thickenings; thickenings of inner wall layer semiannular or nodular, mostly unlike the epidermal one.

We follow Joergensen (325) in recognizing a Lophozoid group. It includes the members of Evans' (Bot. Review 5:49-96, 1939) Jungermanniaceae which have alternate leaves, essentially lobed. They are rather a natural group so far as one can well group them by the present chaotic state of our knowledge of their detailed morphology. They may prove to be related to the Nardioid group through *Jamesoniella* or *Jungermannia*, but until the structure of setae, sporangium and stems is further clarified conclusions must be largely surmise.

- A. Some of the leaves with rhizoids from the margins..... *Acrobolbus*, p. 399.
- AA. None of the leaves with marginal rhizoids.
 - B. Cortical cells of the stem with walls about as thick as the diameter of the cell cavity..... *Saccobasis*, p. 423.
 - BB. Cortical cells of the stem with walls much thinner.
 - C. Whole dorsal margin of the leaf widely recurved; leaf sinus descending $\frac{1}{10}$ - $\frac{1}{6}$ the leaf length..... *Anastrepta*, p. 397.

¹ lō fō" zì òi' dē ē.

- CC. Dorsal margin of leaf not or little recurved; only in occasional leaves, if in any, the sinus descending so little as $\frac{1}{6}$ the leaf length.
- D. Most of the leaves of the middle region of the sterile shoots 2-lobed, although unlobed or 3-lobed leaves may occur.
- E. Stems 7-12 cells thick.
- F. Tips of the leaf lobes mostly rounded or blunt; female bracts not larger than the leaves of sterile shoots, widely spreading from the base; perianth wholly exserted, not plicate, clavate-pyriform; rhizoids few on sterile shoots.....
- FF. Tips of leaf lobes mostly acute to obtuse; female bracts larger than the leaves of sterile shoots, erect or erect-spreading; perianth $\frac{1}{2}$ - $\frac{3}{4}$ -emergent, plicate toward tip.
- G. Rhizoids numerous on sterile stems; perianth clearly widest above or below the middle rather than at it.....
- GG. Rhizoids few on sterile stems; perianth cylindric.....
- EE. Stems more than 12 cells thick.
- H. Underleaves common on the sterile shoots.
- I. Median leaf cells with thick yellowish walls, 15-24 μ
- II. Median leaf cells with thin white walls, 25 μ or larger.....
- III. Median leaf cells with thin white walls, 18-25 μ
- HH. Underleaves wanting or scarce on sterile shoots.
- J. Walls of median leaf cells thick or moderately so.
- K. Trigones in leaf middle yellowish, large to bulging.....
- KK. Trigones in leaf middle whitish, small to large but not bulging.....
- JJ. Walls of median leaf cells thin or only slightly thickened.
- L. In cross section of stem the interior cells hardly larger than the cortical ones....
- LL. In cross section of stem the interior cells distinctly larger than the cortical ones.
- DD. Most of the leaves of the middle region of the sterile shoots 3-4-lobed although 2-lobed leaves may occur.
- M. Sinuses descending $\frac{1}{6}$ - $\frac{1}{2}$ the leaf length; underleaves quite unlike the leaves.
- N. Underleaves common; leaves with cilia at base of ventral margin.
- O. Only an occasional leaf lobe ending in an apiculus, hair points not present; cilia at base of ventral leaf margin composed of cells hardly longer than wide.....
- OO. Leaf lobes quite commonly ending in an apiculus or a hair point; cilia at base of ventral leaf margin composed of cells several times as long as wide.....

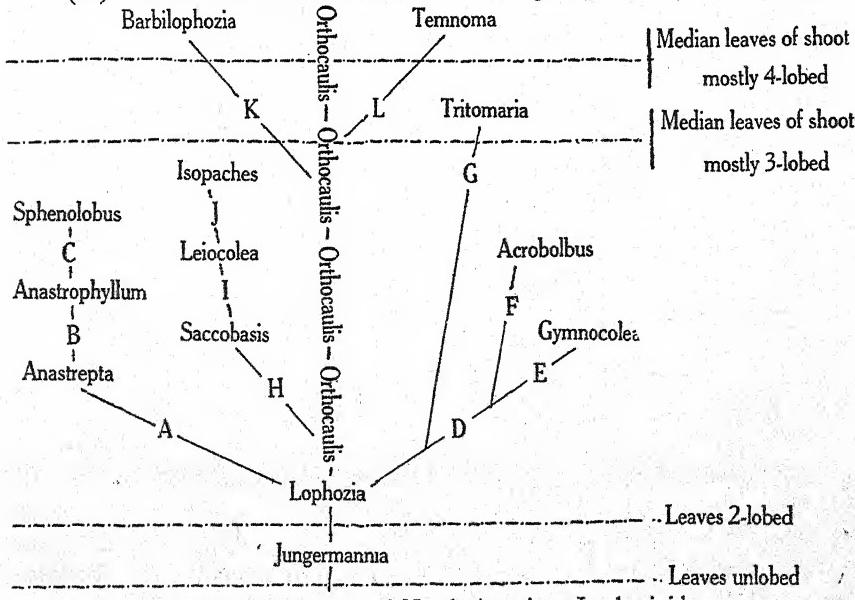
Gymnocolea, p. 367.*Isopaches*, p. 370.*Sphenolobus minutus*, p. 375.*Leiocolea harpanthoides*, p. 380.*Leiocolea*, p. 379.*Orthocaulis kunzeanus*, p. 401.*Anastrophylleum*, p. 393.*Sphenolobus*, p. 374.*Lophozia*, p. 340.*Orthocaulis*, p. 401.*Orthocaulis*, p. 401.*Barbilophozia*, p. 425.

- NN. Underleaves scarce; leaves without cilia at base, or the cilia composed of cells hardly longer than wide.
- P. Leaves symmetric or nearly so, the dorsal and ventral margins equal in length or nearly so.
- Q. Leafy shoots 1-2 mm wide; leaf lobes acute to obtuse but not bluntly rounded; cells of the leaf middle 15-23 μ *Oriocaulis*, p. 401.
- QQ. Leafy shoots 2.5-5 mm wide; leaf lobes bluntly rounded; cells of the leaf middle 23-25 μ *Barbilophozia barbata*, p. 426.
- PP. Leaves quite unsymmetric, the dorsal margin from base to first tooth much shorter than the ventral one..... *Tritomaria*, p. 416.
- MM. Sinuses descending $\frac{2}{3}$ - $\frac{5}{6}$ the leaf length; underleaves very similar to the leaves but commonly with one less lobe..... *Temnoma*, p. 413.

RELATIONSHIP OF THE LOPHOZIOIDEAE

The remarks under the letters below are pertinent at the corresponding letters on the diagram below.

- (A) Whole dorsal margin of leaf widely recurved; sinus descending $\frac{1}{6}$ - $\frac{1}{10}$ the leaf length; underleaves small and fugaceous or wanting.
- (B) Leaf margin incurved; underleaves rare.
- (C) Leaves semicylindrically concave.
- (D) Underleaves rare.
- (E) Leaves without rhizoids from the margin; perigynium wanting.



Phylogenetic diagram of North American Lophozioideae.

(F) Some of the leaves with rhizoids from the margin; rhizoidous perigynium present.

(G) Dorsal lobe of leaf much the shortest when there are 3-4, except in *T. exsecta*; underleaves rare.

(H) Walls of cortical cells of stem very thick.

(I) Walls of cortical cells of stem only moderately thick.

(J) Stem 7-9 cells thick; rhizoids numerous on sterile stems.

(K) Lobes of leaves acuminate; underleaves present, 2-lobed.

(L) Leaf sinus descending $\frac{1}{3}$ - $\frac{1}{6}$ the length; leaf margin ciliate at base; leaf lobes acute; underleaves present throughout, large, 2-lobed.

In this group the female bracts tend to be more toothed or more lobed than the leaves of sterile shoots. This tendency seems to have worked downward in the female shoot and affected the sub-bracteal leaves, and in some species to have affected the whole sterile shoot. Thus the lobing varies with the species, and in some species varies in different regions of the same plant. Commonly one finds more lobes on leaves near the female inflorescence than on the sterile shoots.

Buch (56.5) has segregated some species into genera on the basis of small differences in the structure of the stem. It seems probable to us that the primary separation of species into groups will be on the basis of the structure of the seta, of the sporangium, and perhaps of the perianth. Compared with the reproductive structures, the vegetative characters are phylogenetically of minor importance.

Unfortunately the detailed reproductive characters of the great majority of species have not been observed. It is advisable to cling to the presently accepted genera until we know more about the details of the reproductive parts. Wherever the grouping of species into genera is doubtful, as it is here, the relation of the genera to each other naturally is also doubtful. We conceive the group to be related to the Nardoideae through *Jungermannia* and *Lophozia*, but relationships among the genera of the group remain vague with our present knowledge of morphology.

LOPHOZIA^a Dum. Rec. d'Obs. 17, 1835.

Jungermannia section *Lophozia* Dum. Syll. Jung. Eur. 53, 1831, in part.

Lophozia section *bidentes* Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3):85, 1893, in part.

Lophozia subgenus *Dilophozia* K. Muell., Rabenh. Krypt.-Fl. 6(1):659, 1911, in part.

Jungermannia subgenus *Dilophozia* Arn., Arkiv f. Bot. 19(10):47, 1925, in part.

Plants in patches or mats or growing singly among other bryophytes. Stems 0.4-6 cm long, prostrate to erect, with the growing tip curved toward the dorsal side, more than 10 cells thick; dorsal cortical layer composed of cells 1-2 times as long as wide, thin walled, chlorophyllose;

^a 15 f. 21 a.

ventral 2-3 layers of cortical cells rather shorter than the dorsal ones, without chlorophyll; interior dorsal cells of 3 or more layers distinctly longer but not much greater in diameter than the dorsal cortical ones; ventral interior cells half or more of the stem, shorter and smaller in diameter than the dorsal interior ones; ventral segment at most constituting $\frac{1}{5}$ of the cross section of the stem; branches wanting or few, or rarely fairly abundant; rejuvenations wanting or few. Rhizoids numerous to rarely few, colorless or becoming purplish or reddish especially at their bases, long. Leaves from distinctly succubous to very nearly transversely inserted, not at all decurrent to slightly so dorsally, distant to imbricate, usually erect-spreading to horizontally spreading, rarely appressed or secund, mostly simply 2-lobed but rarely some unlobed or near the perianth 3-5-lobed, various in form, from somewhat longer than wide to somewhat wider than long but mostly these dimensions not greatly different; margins entire to spinose-dentate; halves of the leaves equal or the ventral one the larger, rarely irregularly unequal, their margins entire to spinose-dentate, acuminate to truncate, sometimes apiculate; sinus sometimes wanting but always present on some of the leaves, descending 0- $\frac{2}{3}$ the leaf length, acute to crescentic, from not at all gibbose to distinctly so. Cells of the leaf middle 18-70 μ , of the margin 14-50 μ , near the tips of the lobes 14-50 μ , near the base of the leaves 23-80 μ ; walls thin to slightly thickened; trigones wanting to bulging into the cells; cuticle smooth or verruculose to punctate or minutely striate. Gemmae rare to quite common, at or near the tip of the plant, singly or in head-like masses, on the tips or margins of the lobes of the leaves, 1-2-celled, spherical to ovoid or with 3-8 angles, yellowish green to brownish green or purplish to violescent, in one species colorless, 15-30 μ . Underleaves wanting to scarce or most commonly present near the tips of the female plants only. Plants unisexual or rarely bisexual. Male inflorescence terminal or just beneath the female one, or sometimes farther down the stem or branch; antheridia 1-5 per bract. Female inflorescence terminal on a main shoot; female bracts larger or very rarely smaller than the leaves, 2-5-lobed, their lobes acute to obtuse; bracteole present or very rarely wanting, united with one or both female bracts or more rarely quite free, unlobed or 2-lobed, rarely 3-lobed. Perianth present, $\frac{1}{3}$ - $\frac{4}{5}$ -emergent, cylindric to ovoid or clavate to pyriform, more or less contracted to the mouth, 3-8-plicate at the tip or down as far as the middle; mouth not tubular, entire to ciliate and often lobed or laciniate. Sporangium ovoid to oblong, the wall 2-6 cells thick; epidermis with nodular thickenings; innermost layer of wall with semiannular thickenings. Elaters 6-12 μ wide; spirals 2 or very rarely 3, brownish to reddish or violet. Spores 8-18 μ , verruculose or more rarely papillose, yellowish to brownish or reddish to violet. The name from Gk.

lophos, a point; in reference to the 2 or more lobes and thus 2 or more points to the leaves, in contrast with *Aplozia*, which has unlobed, rounded, pointless leaves.

The genus is a group of mostly closely related species among which the perianth is still the greatest single factor in the consideration of relationships. A comparative study of the details of structure of setae and

LOPHOZIA	3 <i>excisa</i>	6 <i>alpes-tris</i>	7 <i>confer-tifolia</i>	1 <i>grandi-retis</i>
1. Leaf margin entire, sinuate, one dorsal tooth, an occasional tooth or lobe, dentate, spinose.....	e-r	e	e	e-n-c
2. Plants unisexual, bisexual.....	b	u	u	u
3. Trigones of median leaf cells none, small, large, bulging, very, moderately.....	n-vs	ms	ml	s
4. Cells near tips of leaf lobes in μ	20-28	14-20	15-20	40-50
5. Cell walls of well matured leaves, mostly brownish.....	-	+	\pm	-
6. Leaf sinus conspicuously, or not to hardly gibbous.....	h	h	h	
7. Gemmae spherical, ovoid, or with 3 or more angles.....	a	a	a	a
8. Leaves greater in length or width, or the two equal.....	l-e	e-w	e (?)	w
9. Gemmae colorless, greenish, yellowish, brownish, purplish, reddish, violaceous.....	p	r-n	y-g-rn	yg
10. Depth of sinus expressed in leaf length.....	$\frac{1}{3}$	$\frac{1}{5}-\frac{1}{3}$	$\frac{1}{4}-\frac{1}{3}$	$\frac{1}{4}-\frac{1}{3}$
11. Mouth of perianth entire, denticulate, crenulate, laciniolate, lobed, ciliate.....	n+c	b	b+d	e-d
12. Male inflorescence terminal, just below the tip, or farther down the shoot.....	b	t-f	t-f	
13. Rhizoids few, numerous, moderately.....	n	n	n	n
14. Rhizoids colorless; or their bases purplish, reddish, brownish, not colorless.....	c	c-r	c-b	n
15. Perianth oblong, cylindric, ovoid, clavate, obovoid, pyriform.....	y-bv	y	bv-p	p
16. Leaf lobes acuminate, acute, obtuse, roundish, truncate, apiculate, right-angular.....	a	a-o	a-o	a-o
17. Gemmae large, or the size in μ		15-18	15-24	25-30
18. Cells of leaf middle in μ	20-34	18-26	20-30	40-70
19. Leaf sinus acute, right-angular, obtuse, rounded, crescentic, narrowly.....	i-c	a-c	o-R-c	a-r
20. Antheridia per male bract.....	1-2	2-3	1-2	3-5

sporangia may help materially. So long as the reproduction in *L. jensenii* and *L. violascens* remains unknown or largely so, their status as species and likewise their relation to other species are in question.

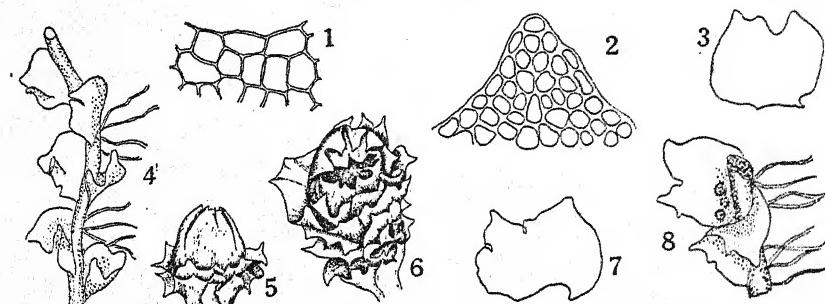
The species are difficult to distinguish without the reproductive characters. Since these are not always present it is believed that a comparison will be more valuable than simply a key.

8 mar-chica	11 mil-deana	2 silvi-cola	5 ventri-cosa	4 longi-flora	12 wen-zelii	14 longi-dens	9 jen-senii	10 violas-cens	13 porphyr-oleuca	15 incisa
e-n-d	e-n	e	e	e	e	e	e	e	e	d-id
u	u	u	u	u	u	u	u	u	u	u
n	n-vs	s-1	s	ms	s-ms	vs	n-ms	vs	b	vs-s
35	33	20-29	20-25	20-27	20-25	20-25	18-26	25-30	24-26	22-30
-	-	-	-	-	-	-	-	-	-	-
c	c		h	h	h	h	h		h	h
s-o	a-s-o	a	a	a	a	a	s-o	o	a	a
w	w	l	e	e	e-w	e-1	w	e	e	e-1
g		c	yg-yn	yg	yg	g-yn-rn	yr	v	yg-yn	yg
½-¾	½	½-¼	¼-½	¼-½	½-¼	¼-½	½-¼	0-½	¼-½	½-½
d	b+d	c-d	d	d	b+d	{ b+ (ld-l) }			b+ld	b+ld
t	t		t	f	t	t	t		t	t
mn	n	n	n	n	f	mn	n	n	n	n
p	c		c	c-r	c-r	c	c	c	c	c
1-v	y-1	y	bv	by-y	y-vy-v	1-o			y	o-p
a-r	m-r	a-i	a	a-o	o-r-p	a-r	o-r	a-o	a	a-o
16	25	17-35	18-22		20	20-25	17-22	r	18-22	15
40-50	30-45	25-35	25-30	26-31	23-30	25-30	20-30	30-35	25-35	27-36
r-c	nr	o-c	o-c	a-r	a-c	o-c	i-o	a-c	o	a-r
1-2	1-2		1-2	2-3	1-2	1-2	2		2-3	1-2

1. *Lophozia grandiretis*³ (Kaal.) Schiffn., Lotos 51(7):20, 1903.

Jungermannia grandiretis Lindb., Medd. Soc. Fauna Fl. Fennica 9:158, 1883,
the name only (according to Evans [171]). Also Kaalaas, Nyt. Mag.
Naturvid. 33:322, 1893.

Plants in patches or mats, or among mosses. Stems 1-5 cm long, simple or forked above, rejuvenating below the perianth, thick, rather fleshy, ventrally purplish violet to blackish brown, oval in cross section. Rhizoids numerous, long, the basal part colored. Leaves plainly succubous, dorsally decurrent, distant, or densely imbricate near tips especially on female plants, horizontally spreading at least when distant, more or less



Lophozia grandiretis. 1, Leaf cells, x 93. 2, Cells of the leaf tip, x 64. 3, Leaf, x 13.7. 4, Part of swamp plant, x 8.5. 5, Perianth, x 16. 6, Tip of sterile shoot, x 16. 7, Leaf, x 13.7. 8, Part of shoot with 2 male bracts, x 10.6. (1, after Jensen; 2-4, 7-8, after K. Mueller; 5-6, after Meylan.)

adaxially concave, simply 2-lobed or the upper leaves 3-lobed; somewhat rectangular to reniform, wider than long, pale green; margin except for apical teeth entire to sinuate or with an occasional rounded tooth or lobe; lobes broadly triangular, somewhat unequal with the ventral the larger, acute to obtuse, often curved toward stem; sinuses descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, acute to right-angled or more commonly rounded. Cells of the leaf middle 40-70 μ , of the lobes and margin 40-50 μ , of the base 50-80 μ , rounded-polygonal, not very chlorophyllose; walls slightly thickened; trigones rather small; cuticle smooth. Gemmae on the tips of the upper leaves, mostly 4-5-angled to stellate, 1-2-celled, 25-30 μ , yellowish green. Underleaves wanting except among the female bracts. Plants unisexual. Male bracts similar to the leaves, 2-lobed, not saccate at base; antheridia 3-5, spherical, shortly stalked, yellowish green. Female bracts large, almost twice as wide as long, 2-3-lobed; the lobes short, acute, entire; bracteole irregularly 2-3-lobed, united with both female bracts. Perianth very short, pyriform, but little emergent, bluntly 3-angled near

³ grān di rē' tis.

tip with one angle dorsal and two lateral, little contracted to mouth; mouth wide, with or without teeth; the teeth thinly walled projecting cells. Seta about 1 cm long. Sporangium reddish brown; epidermal cells with nodular thickenings; innermost layer of wall with semiannular thickenings. Elaters about 90μ long, $10-12 \mu$ thick; spirals 2, loosely wound. Spores $15-18 \mu$, verruculose, brown. Name from *L. grandis*, great, and *rete*, a net; in reference to the size of the leaf cells as compared with *L. incisa*, its near relative.—On damp soil in marly swamp.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 322; Meylan (386) fig. 111; Jensen (323.5) 117, 1 fig.

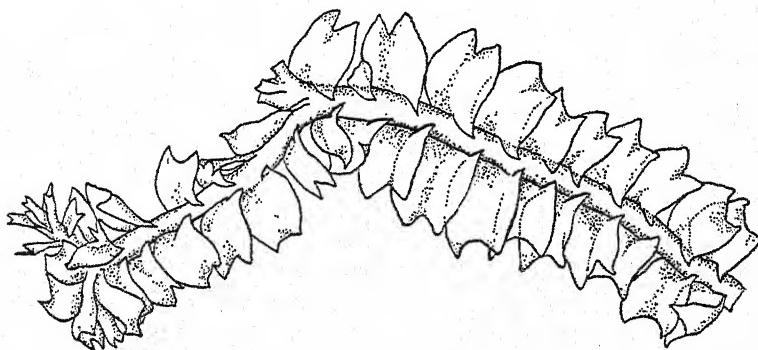
EXAMINATIONS: Minn. Grand Marais in Cook County (Conklin 2036) 1927.

TYPE LOCALITY: European.

RANGE: Vt. (171), Minn. (97), Alta. (46.2); Eur. (409).

2. *Lophozia silvicola*⁴ Buch, Ann. Bryologici 6:125, 1933.

Plants in patches or scattered among mosses, bluish green to reddish green, leafy shoots 3-6 mm wide. Stems 1-2 cm long, prostrate to ascending, with short or long branches; cross section elliptic, about 230μ wide and 190μ thick, with some dorsiventral differentiation; epidermal cells almost isodiametric, about the same all around the stem, $25-30$ by $17-23 \mu$; dorsal epidermis quite green; under the dorsal epidermis 3-4 layers of cells with little chlorophyll, longer and wider, $55-95$ by $17-25 \mu$; ventral epidermis brownish; under the ventral epidermis to the center and beyond



Lophozia silvicola. Sterile plant, dorsal view, $\times 9$. (After Buch.)

the cells smaller, $30-50$ by $10-20 \mu$, often with brownish fungal hyphae in and among them. Rhizoids numerous. Leaves distinctly succubous, not or hardly decurrent, contiguous to imbricate, widely and somewhat horizontally spreading, simply 2-lobed or rarely some 3-lobed, roundish-rectangu-

⁴ sil' vi' kō lä.

lar to obovate, widest shortly above the middle, 0.8-1.4 mm long, 0.7-1 mm wide, in dense shade not strongly concave, 1 cell thick except near the insertion 2-3 cells thick; margin entire except for the apical lobes; lobes mostly acute to right-angular; sinus descending $\frac{1}{5}$ - $\frac{1}{4}$ the leaf length, obtuse to crescentic. Cells of the leaf middle 25-35 μ , of the lobes 20-29 μ , of the base up to 40 μ long, roundish-polygonal; walls thin; trigones small to large; oil bodies present in all cells, 15-25, occupying $\frac{1}{2}$ - $\frac{2}{3}$ the cell hollow, disappearing after the death of the cell, consisting of a colorless to slightly bluish center surrounded by a thick translucent slightly brownish layer. Gemmae in densely branched tufts, nearly always present on the tips of the dorsal lobes of the young leaves of sterile plants, rhombic to pyriform, with projecting angles, 2-celled, 17-22 by 25-35 μ , colorless. Underleaves wanting on sterile stems, replaced by simple slime-papillae. Plant unisexual. Male bracts strongly concave, mostly reddish. Female bracts somewhat larger than the leaves, often 3-4-lobed. Perianth cylindric, about 2 mm long, near tip plicate, contracted to mouth; mouth dentate to crenate; teeth alternately longer and shorter, 1-2-celled. Spores 11-13 μ , somewhat papillose. The name from *L. silva*, forest, and *colere*, to inhabit; from its habitat in damp shady woods.—On bare humus, on rotten wood, on rocks thinly covered with humus, among *Sphagnum* and other mosses; in damp places or in shade.

ILLUSTRATIONS: Buch, Ann. Bryologici 6:9, fig. 6; also 126, figs. 1-5; and 129, figs. 1-3; 1933; Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):285, fig. I, 1-3, 1933.

EXAMINATIONS: None.

TYPE LOCALITY: Lovisa in the province of Nylandia, Finland (Buch) 1915.

RANGE: Mich. (419.1); Eur. (56.6).

The Michigan locality is near Negaunee, about Lat. $46^{\circ} 33'$ N., Long. $87^{\circ} 36'$ W. This occurrence in Michigan makes it likely that it is fairly widespread in northern North America. The European records, so far as we find them, are limited to Finland and Sweden.

3. *Lophozia excisa*⁵ (Dicks.) Dum. Rec. d'Obs. 17, 1835.

Jungermannia excisa Dicks. Pl. Crypt. Brit. Fasc. 3:11, 1793.

Jungermannia excisa var. *crispata* Hook. Brit. Jung. pl. 19, fig. 11, 1816.

Jungermannia capitata Hook. Brit. Jung. pl. 80, 1816.

Jungermannia intermedia Lindenb. Nova Acta Acad. Caes. Leop.-Carol. Nat. Cur. 14, Suppl.: 83, 1829.

Jungermannia arenaria Nees Naturg. Eur. Leberrm. 2:132, 1836.

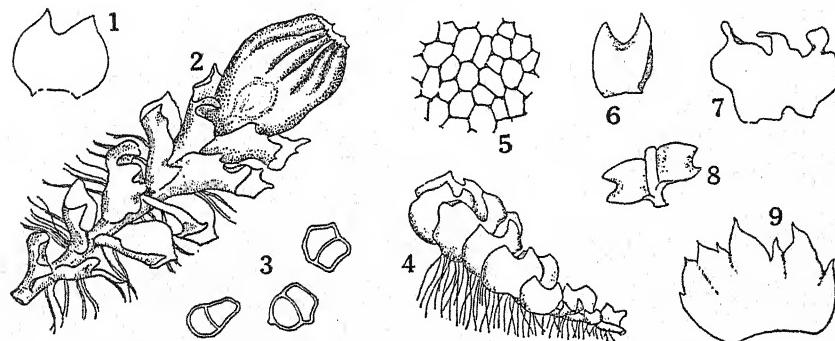
Jungermannia excisa var. *crispa*⁶ of Underw. in A. Gray's Manual of Bot., Ed. 6, 720, 1889.

Plants in small patches or growing among mosses, pale green to tinged with red. Stems 5-10 mm long, prostrate to ascending, pale green or ventrally brownish, usually unbranched but sometimes with numerous rejuvenations from beneath the female inflorescence. Rhizoids numerous,

⁵ ex si' sā.

⁶ Apparently *crispa* was written when *crispata* was intended.

long, colorless, present to tip of stem. Leaves slightly succubous, shortly decurrent dorsally, distant to imbricate, horizontally spreading below to erect-spreading near tip, simply 2-lobed, ovate-quadrata, about half clasping the stem, larger upward on stem; margin usually entire except for apical lobes, but in rather rare cases leaves occur with a tooth on the dorsal margin; lobes acute to less commonly obtuse, the dorsal one sometimes



Lophozia excisa. 1, Leaf, x 16. 2, Shoot with perianth, x 16. 3, Three gemmae, x 318. 4, Sterile shoot, x 16. 5, Leaf cells, x 148. 6, Leaf, x about 20. 7, Female bract, x 16. 8, Piece of sterile shoot, dorsal view, x about 16. 9, Female bract, x 13.2. (1-2, 4-5, 7, after K. Mueller; 3, 9, after Warnstorff; 6, 8, after Hooker.)

slightly the smaller; sinus descending about $\frac{1}{3}$ the leaf length, right-angled to usually crescentic. Cells of the leaf middle 28-34 μ , of the margin and tips 20-28 μ , of the base 32-36 μ , polygonal; walls thin; trigones none or minute; cuticle smooth. Gemmae at the tips of the lobes of the upper leaves, pyramidal to 3-5-angled, purple. Underleaves wanting, except among the female bracts. Plants bisexual. Male inflorescence below the female one; antheridia 1-2, oval-globose; paraphyses wanting. Female inflorescence terminal; female bracts larger than the leaves, grading into them, transversely inserted, erect-spreading, crispat, 3-5-lobed, wider than long, the margin usually somewhat dentate; bracteole united to one or both bracts, lanceolate to oblong-ovate, entire to bifid. Perianth almost cylindrical to oblong-ovoid, $\frac{1}{2}$ - $\frac{2}{3}$ -emergent, plicate in the upper $\frac{2}{3}$, slightly to much narrowed to the mouth; mouth wide in the typical material, lacinate, the laciniae crenulate with longly projecting cells. Sporangium ovoid-oblong, reddish brown, its wall of 3-4 layers; epidermis with nodular thickenings; innermost layer with incomplete semiannular thickenings. Elaters about 8 μ thick; spirals 2, reddish brown. Spores 12-17 μ , verrucose, brown. The name the *L. excisus*, cut off or hewn down; apparently in reference to the truncate tip of the perianth.—On soil of banks, on old walls, on rotten wood; from lowlands to alpine.

ILLUSTRATIONS: Pearson (433) 2: pl. 138; K. Mueller (409) 1: fig. 317; Hooker (285) pl. 9; Haynes, Bryologist 9: pl. 9, figs. 10-13, 1906; Macvicar (374) 189, figs. 1-7; Meylan (386) fig. 107; Ekart (124) pl. 4, fig. 29; Warnstorff (523) 192, fig. 4; Gil (76) fig. 239; Jensen (323.5) 125, 3 figs.

EXAMINATIONS: Alta. Banff (Brinkman 538) 1912.—B. C. Golden (W. R. Taylor 46) 1923; Hector (Brinkman 817) 1913.—Conn. Madison (Lorenz) 1925; North Haven (Evans) 1906.—Minn. Carlton (Conklin 2123) 1911; Duluth (Conklin 1860) 1911; Stillwater (Holzinger) 1890.—N. S. Halifax (Brown 29) 1931. N. Y. Syracuse (Underwood & Cook) 1891.—Wash. Stevens Pass (Miller) 1934.—Wis. Cornucopia (Conklin 1853) 1923.—Wyo. Continental Divide west of Dubois (Frye) 1931.

TYPE LOCALITY: On Holt and Edgefield heaths, England (Dickson). Holt is about Lat. $52^{\circ} 54' N.$, Long. $1^{\circ} 7' E.$

RANGE: Greenland (325), Ellesmere Isl. (56.01), Labrador (510), N. S. (53.2), Me. (164), N. H. (145), R. I. (169), Conn. (212), N. J. (506), N. Y. (59), Que. (178), Ont. (373), Mich. (415), Wis. (98), Minn. (95), Wyo. (83), Alta. (46.2), B. C. (212), Ida. (508), Wash. (202), Calif.⁷ (202); Asia (350); Eur. (374).

Since there was confusion between *L. excisa* and *L. birenata*, it is desirable that someone examine the material of the two with a view to getting the distribution of the two species. Reports of its occurrence, especially long ago, are not to be relied upon. The whole distribution needs checking with material.

4. *Lophozia longiflora*⁸ (Nees) Schiffn., Lotos 51(7):45, 1903.

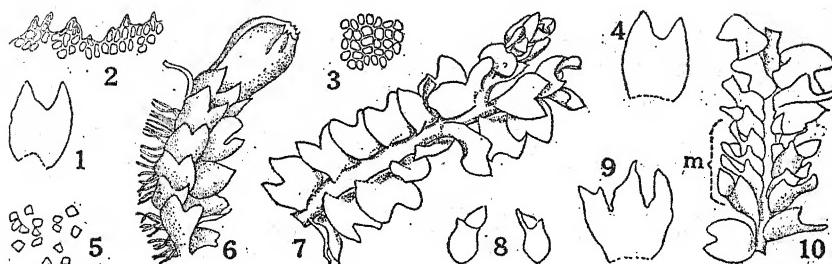
Jungermannia longiflora Nees Naturg. Eur. Leberm. 2:95, 1836.

Jungermannia ventricosa var. *longiflora* Macoun Cat. Canadian Pls. 7:17, 1902.

Plants in tufts or scattered, yellowish green, usually tinged with carmine. Stems ascending, somewhat arcuate, deep reddish black, tinged with carmine, simple or branched, often with an innovation beneath the female inflorescence. Rhizoids numerous, colorless or carmine toward base. Leaves succubous but nearly transversely inserted, not decurrent, rather closely imbricate, erect-spreading, simply 2-lobed or sometimes those near a female tip 3-lobed, oblong-quadrangular, unsymmetric, somewhat fleshy, somewhat boat-shaped in its concavity, often tinged with red at base; margins entire except for the apical lobes, the ventral margin more arched than the dorsal; lobes inclined to be unequal with the dorsal one the narrower, triangular, acute to obtuse, somewhat incurved; sinuses descending about $\frac{1}{3}$ the leaf length, obtuse to rounded, or sometimes acute toward base of stem. Cells of the leaf middle 26-31 μ , of the margin and tips 20-27 μ , of the base 30-33 μ , rounded-polygonal; walls thin; trigones usually distinct; cuticle smooth. Gemmae not common, 3-4-angled, thinly walled, yellowish green. Underleaves wanting except among the female bracts. Plants unisexual. Male plants rare; male inflorescence along the stem; male bracts saccate; antheridia 2-3. Female inflorescence terminal; female bracts larger than the leaves, erect-spreading to erect,

⁷ Spelled *L. excisa*, evidently by error.

⁸ lōn'jī flōr'ā.



Lophozia longiflora. 1, Leaf, x 23. 2, Part of mouth of perianth, x 114. 3, Cells of leaf middle, x 114. 4, Leaf, x 23. 5, Gemmae, x 114. 6, Tip of shoot with perianth, x 23. 7, Part of plant, dorsal view, x 23. 8, Two male bracts, x 23. 9, Female bract, x 23. 10, Part of plant with male (*m*) inflorescence, x 23. (All after Lorenz.)

embracing the lower part of the perianth, adaxially concave, 2-5-lobed; the lobes unequal, ovate-triangular, acute to subacute; the sinuses $\frac{1}{4}$ - $\frac{1}{3}$ the bract length, acute; bracteole often united with one of the bracts, oblong to lingulate, entire to bilobed. Perianth oblong-cylindric to almost cylindric, large, 4-5 mm long, 1.5-2.5 mm wide, brown but faded to reddish toward mouth, often reddish at base, $\frac{1}{2}$ - $\frac{3}{5}$ -emergent, bluntly 3-plicate above where obtusely narrowed to mouth; mouth unlobed, toothed; the teeth rather distant, mostly one cell but occasionally 2 cells long. Sporangium oblong-ovoid, dark reddish brown; epidermal layer of quadratic cells with nodular thickenings; innermost layer with semiannular thickenings. Elaters 80-100 μ long, 7-9 μ thick; spirals 2-3, reddish brown. Spores 14-16 μ , verruculose, brown. So named on account of its long perianth.—Among peat moss, among mosses on wet rocks, on trunks of trees; subalpine.

ILLUSTRATIONS: Lorenz, Bryologist 13: pl. 4, 1910; K. Mueller (409) 1: fig. 311; Macvicar (374) 183, figs. 1-3; Meylan (386) fig. 115.

EXAMINATIONS: Alta. Banff (Brinkman 671) 1912; Healy Creek (Brinkman 941) 1913.—B. C. Hector (Brinkman 592) 1912; Silverton (MacFadden 614) 1926.—N. H. Carrigain Pond in Lincoln township (Lorenz 434) 1908.—Minn. Grand Marais in Cook County (Conklin 2665) 1926.—Wis. Douglas (Conklin 1008) 1910.

TYPE LOCALITY: "Im Riesengebirge," Silesia, Germany.

RANGE: Que. (431), Me. (369.1), N. H. (360), Wis. (98), Minn., Alta. (46.2), B. C. (371); Eur. (325); Spitzbergen (524.3).

5. *Lophozia ventricosa*^a (Dicks.) Dum. Rec. d'Obs. 17, 1835.

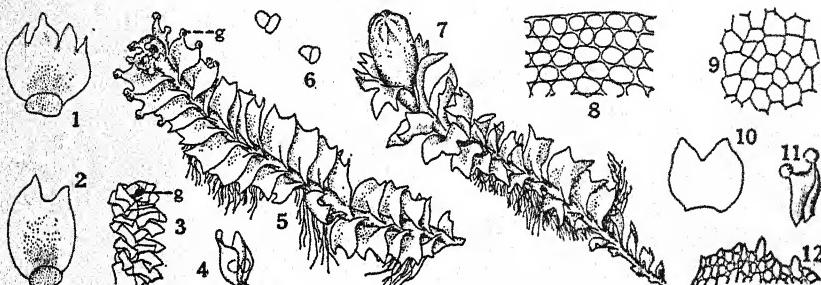
Jungermannia ventricosa Dicks. Pl. Crypt. Brit. Fasc. 2:14, 1790.

Jungermannia globulifera Roth, Tent. Fl. Germ. 3:379, 1803; not of C. Jensen, Medd. om Groenland 30:306, 1906.

Plants in sods or scattered among mosses, dark green to yellowish green. Stems 1-4 cm long, prostrate to ascending, green above, usually brownish to violet beneath, simple or little branched, often with innova-

^a věn tri kō' sū.

tions beneath the female inflorescence. Rhizoids numerous, long, colorless, present to near tip of stem. Leaves succubous but not strongly, diagonally inserted, shortly dorsally decurrent, contiguous to imbricate, widely spreading to erect-spreading, somewhat horizontal to almost vertical, about half embracing the stem, simply 2-lobed, quadrate-ovate to quadrate, flat to obtusely keeled; margin entire except for the apical lobes; lobes triangular, acute; sinus descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, rounded to obtuse or crescentic. Cells of the leaf middle 25-30 μ , of the margin about 24-25 μ , of the base 28-30 μ , rounded-polygonal; walls thin; trigones small; cuticle usually smooth. Gemmae always present, in spherical groups, at the tips of the lobes of the upper leaves, irregularly three- to many-angled but isodiametric, 18-20 μ , 1-2-celled, yellowish brown.



Lophozia ventricosa. 1-2, Female bracts, x 10.2. 3, Tip of shoot, with gemmae (g), x 5.3. 4, Male bract, x 10.2. 5, Shoot, with perianth, x 6.4. 6, Two gemmae, x 148. 7, Shoot with perianth, x 6.4. 8, Cells along leaf margin, x 106. 9, Leaf cells, x 119. 10, Leaf, x 10.6. 11, Gemmiparous leaf, x about 8. 12, Part of mouth of perianth, x 74. (1-2, 4, after Pearson; 3, 6, 12, after Jensen; 5, 7, 9-10, after K. Mueller; 8, original; 11, after Hooker.)

Underleaves wanting except among the bracts. Plants unisexual; both inflorescences terminal. Male plants in separate patches; male bracts 10-16, transversely inserted, imbricate, erect-spreading, broadly oval, concave, saccate at base; antheridia 1-2, oval, on a stalk half as long; paraphyses few. Female bracts larger than the leaves, erect-spreading, concave, usually 2-lobed but sometimes 3-5-lobed; the lobes small, triangular, unequal, acute; the sinuses about $\frac{1}{3}$ the bract length, usually plicate; bracteole broadly lanceolate, entire or 2-lobed, adnate to one or both bracts. Perianth oblong-ovoid, $\frac{1}{3}$ - $\frac{2}{3}$ -emergent, smooth, obtusely 4-5-plicate above where rounded to the mouth; mouth hardly lobed, dentate with 1-celled teeth. Sporangium oblong-ovoid, darkly reddish brown, the wall 3 cells thick; epidermal cells quadratic, with nodular thickenings; innermost layer of wall cells with semiannular thickenings. Elaters 85-125 μ long, 7-9 μ thick; spirals 2, reddish brown. Spores 10-15 μ ,

minutely verruculose, brownish. The name the *L. ventricosus*, distended or bellied; in reference probably to the rather distended perianth.—On soil, on tree trunks, among and on rocks, on sand; subalpine and lowlands.

ILLUSTRATIONS:¹⁰ K. Mueller (409) 1: fig. 309; Pearson (433) 2: pl. 140; Jensen (323.5) 125, 5 figs.; Macvicar (374) 179, figs. 1-6; Buch, Annales Bryol. 6:7-14, fig. 7, 1933; Warnstorff (523) 184, fig. 3, ab, d, f; Meylan (386) fig. 112; Gil (76) figs. 235-236; Hooker (285) pl. 24; Ekart (124) pl. 7, fig. 58 (pl. 10, fig. 78, doubtful).

EXAMINATIONS: *Alaska*. Copper Center (Thompson) 1933.—*Alta.* Waterton Park (Rakestraw) 1937.—*B. C.* Fairmont Hot Springs (Rakestraw) 1937.—*Cal.* Mt. Lassen National Park (Rakestraw) 1936.—*Colo.* Longs Peak (Kiener) 1934.—*Ida.* Cascade (Miller) 1937.—*Me.* Mt. Desert (Greenwood 277) 1935.—*Mich.* Negaunee (Nichols) 1935.—*Minn.* Carlton (Conklin 658) 1909.—*Mont.* Whitefish (Frye) 1928.—*N. H.* Mt. Mossilauke (Kingman 2006) 1912.—*N. Y.* Lake Placid (Haynes 126) 1902.—*N. S.* Halifax (Brown 216) 1922.—*Ont.* Quetico National Park (R. G. Lindeberg 390) 1935.—*Ore.* McKenzie Pass (Rakestraw) 1936.—*Pa.* Pittsburgh (Conklin) 1914.—*Que.* Tadousac, Saguenay (Evans 57) 1915.—*Vt.* Mt. Mansfield (Dutton 1762) 1922.—*Wash.* Friday Harbor (Frye) 1925.—*W. Va.* Cooper's Rock (Sheldon 3024) 1907.—*Wis.* Bayfield County (Conklin 1961A) 1923.—*Wyo.* Dubois (Clayton 716) 1930.

TYPE LOCALITY: Great Britain.

RANGE: Greenland (248), Ellesmere Isl. (231.9), Melville Peninsula (277.2), Labrador (510), Anticosti Island (373), N. S. (53.2), N. B. (373), Me. (369.1), N. H. (359), Vt. (203), Mass. (169), R. I. (203), Conn. (155), N. Y. (4), Que. (522.1), Ont. (373), Pa. (338), Mich. (213), Wis. (9), Minn. (94.1), Iowa (469), Colo. (175), Wyo. (446), Mont. (328), Alta. (431), Yukon (51), Alaska (135), B. C. (48), Ida. (81), Wash. (390), Ore. (81), Cal. (310), N. C. (43), W. Va. (468); Asia (387); Eur. (374); Spitzbergen (524.3); Jan Mayen Isl. (248.1); Iceland (248.1).

6. *Lophozia alpestris*¹¹ (Schleich.) Evans, in Kennedy & Collins, Rhodora 3:181, 1901.

Jungermannia alpestris Schleich., in Web. Hist. Musc. Hep. Prodr. 80, 1815.

Jungermannia sudetica Hueben. Hep. Germ. 142, 1834.

Jungermannia goeppertiana Hueben. Hep. Germ. 254, 1834.

Jungermannia curvula Nees Naturg. Eur. Leberrm. 2:117, 1836.

Jungermannia sicca Nees Naturg. Eur. Leberrm. 2:118, 1836.

Jungermannia tumidula Nees Naturg. Eur. Leberrm. 2:233, 1836.

Jungermannia gelida Tayl., London Jour. Bot. 4:277, 1845.

Cephalozia alpestris Cogn. Hep. Belg. 35, 1872.

Jungermannia alpestris var. *gelida* Cooke Handb. Brit. Hep. 186, 1894.

L. gelida Steph., Bull. Herb. Boissier, Ser. 2, 2:236, 1902; also Sp. Hep. 2:136, 1902.

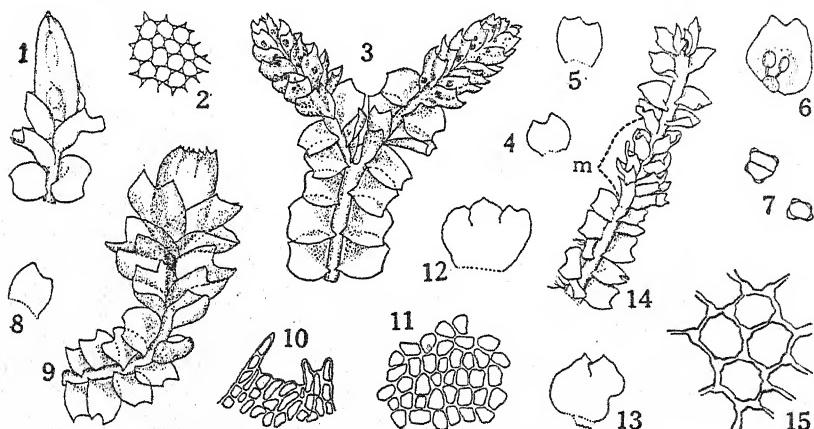
L. alpestris var. *gelida* Macv., Ann. Scot. Nat. Hist., No. 49, 1904.

Plants in small compact tufts or scattered among mosses, olive green to usually brown or sometimes purplish red. Stems 0.4-4 cm long, creeping to ascending, rigid, flexuous, brown to nearly black or more rarely green, the ventral side darker and often wine red; branches few or none. Rhizoids numerous to near tip of stem, long, colorless to wine red at base. Leaves distinctly succubous, imbricate, hardly to slightly dorsally decur-

¹⁰ Before Schiffner's Kritische Bemerkungen in Lotos 51:61 of reprint, 1903, figures are often unreliable because *L. ventricosa* was not clearly differentiated from *Lophozia porphyroleuca*.

¹¹ āl pēs' trīs.

rent, horizontally widely spreading below, often erect-spreading toward tip of stem and concave to canaliculate-concave, simply 2-lobed, broadly ovate to quadrate or roundish, about half embracing the stem; margin entire except for apical lobes, reflexed; lobes acute to obtuse, usually more or less incurved; sinus descending $\frac{1}{10}$ - $\frac{1}{3}$ the leaf length, crescentic, in some leaves deeper and acute. Cells of the leaf middle 18-26 μ , of the tips and margin 14-20 μ , of the base 23-33 μ , rounded-polygonal; walls thickish, usually brown; trigones fairly well developed; oil bodies numerous; cuticle smooth or verruculose. Gemmae in masses, at the tips of the upper leaves of sterile or male plants, with 3 or more angles, 1-2-celled, 15-18 μ , reddish brown. Underleaves rare except among the male and female bracts, awl-shaped to lanceolate, 2 or more cells wide, sometimes 2-lobed. Plants unisexual. Male plants often in separate tufts; male inflorescence terminal or farther down the stem; male bracts 6-20, imbricate, erect-spreading, concave, saccate at base, 2-lobed; antheridia 2-3, globose, longly stalked, among short hair-like paraphyses. Female bracts larger than the leaves, concave, appressed to the perianth, oblong-rounded to oval-rounded, emarginate to 2-3-lobed, entire except for the apical lobes; the lobes subacute to obtuse; the sinuses obtuse; bracteole wanting or present, roundish ovate to narrowly ovate, usually shortly 2-lobed, usually united with one or both bracts. Perianth long-cylindric, $\frac{1}{2}$ - $\frac{2}{3}$ -emergent, smooth but obtusely plicate above where rather gradually narrowed to the mouth; mouth rather wide, denticulate with projecting cells. Spor-



Lophozia alpestris. 1, Tip of plant with perianth, dorsal view, x 46. 2, Leaf cells, x 93. 3, Two male inflorescences, dorsal view, x 8.5. 4-5, Leaves, x 46. 6, Male bract, x 12.7. 7, Gemmae, x 186. 8, Leaf, x 46. 9, Tip with perianth, x 12.7. 10, Part of mouth of perianth, x 456. 11, Cells of the leaf middle, x 456. 12, Female bract, x 46. 13, Male bract, x 46. 14, Shoot with male (m) inflorescences, dorsal view, x 46. 15, Cells of the leaf middle, x 800. (1, 4-5, 8, 10-14, after Lorenz; 2, 7, after Jensen; 3, 6, 9, after Pearson; 15, original, by Elsie K. Waddingham.)

angium broadly ovoid, reddish brown; the innermost layer with reddish brown semiannular thickenings. Elaters about $100\ \mu$ long and $7\ \mu$ thick; spirals 2, reddish brown. Spores $12-14\ \mu$, verrucose, bright reddish brown to violet brown. The name the *L. alpestris*, pertaining to the Alps or to high mountains; in reference to its high mountain habitat.—On moist soil, on rocks, on stones in brook, or among mosses; mostly alpine.

ILLUSTRATIONS: Lorenz, Bryologist 13: pl. 8, 1910; Pearson (433) 2: pl. 142; K. Mueller (409) 1: fig. 313; Macvicar (374) 187, figs. 1-4; Warnstorff (523) 184, fig. 5; Meylan (386) fig. 118; Gil (76) fig. 237; Jensen (323.5) 125, 3 figs.

EXAMINATIONS: *Alta.* Altrude Lakes in Banff National Park (Rakestraw) 1937.—*B. C.* Kootenay National Park (Rakestraw) 1937.—*Cal.* Gold Lake in Plumas County (Sutcliffe) 1926.—*Colo.* Longs Peak (Kiener) 1936.—*Labrador.* Hopedale (Perrott) 1925.—*Me.* Mt. Katahdin (Lowe) 1932.—*Mich.* Pictured Rocks in Alger County (Steere 740) 1934.—*Minn.* Duluth (Conklin 790) 1909.—*Mont.* Sula (Frye) 1929.—*N. H.* Waterville (Lorenz 93) 1906.—*N. Y.* Little Moose Lake in Herkimer County (Haynes 761) 1904.—*N. S.* Cape Breton Island (Nichols 4) 1909.—*Que.* Roberval, St. John Lake (Victorin 19241) 1924.—*Vt.* Mt. Horrid, near Rochester (Dutton 157) 1909.—*Wash.* Elwha River Valley in Olympic Mts. (Frye) 1907.—*Wyo.* Norris Geyser Basin in Yellowstone National Park (Frye) 1925.

TYPE LOCALITY: European.

RANGE: Greenland (248), Pim Isl. (56.01), Ellesmere Isl. (56.01), Baffin Isl. (485.6), Arctic Amer. Archipelago (248.1), Alaska (239.1), B. C. (371), Wash. (81), Cal., Colo., Wyo. (84), Mont. (81), Alta. (46.2), Minn. (94.1), Wis. (98), Mich. (483), Ont. (373), Que. (522.1), N. Y. (258), Conn. (169), Mass. (361), Vt. (203), N. H. (359.1), Me. (369.1), N. S. (53.2), Labrador; Asia (308.1); Eur. (354.1); Spitzbergen (524.3); Iceland (248.1).

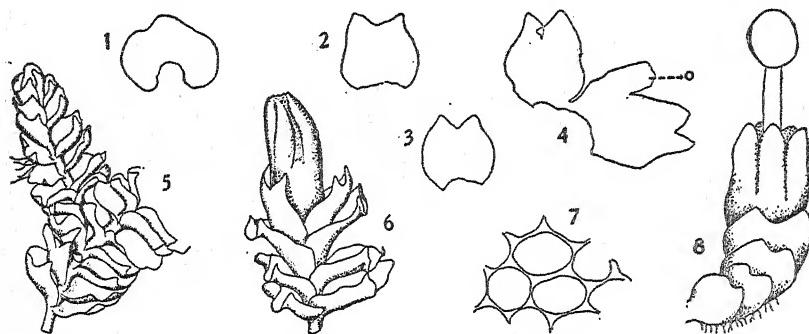
The form or variety *gelida* has been reported from British Columbia by Brinkman (51.1). We do not consider it varietally distinct.

7. *Lophozia confertifolia*¹² Schiffn., Oesterr. Bot. Zeitschr. 55:47, 1905.

Plants in patches or mats, or rarely singly among mosses, green to greenish brown, the ventral leaf bases often dark carmine. Stems 1-3 cm long, prostrate to ascending, thick, rigid, brown, never reddish, green when young, branched; branches one to several, lateral, widely spreading. Rhizoids numerous, colorless or with brownish base. Leaves nearly transversely inserted but slightly succubous, slightly decurrent dorsally, rather closely imbricate, spreading, simply 2-lobed, roundedly oval to broadly elliptical, concave to semicylindrically so, strongly secund dorsally, thick, rather rigid, the dorsal end of the insertion about the middle of the stem; apex curved toward the tip of the plant; margin entire; lobes unequal, the ventral slightly larger, broadly triangular, somewhat incurved, acute to obtuse; sinus descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, obtuse to usually rounded or crescentic. Cells of the leaf middle 20-30 μ , of the apex 15-20 μ , the cell cavity circular to elliptical, opaque; walls thin in the middle of the area of contact of two cells but thick toward the angles, often brownish; trigones rather large but not bulging; cuticle smooth or nearly so.

¹² kön fér" tī fō' lī ä.

Gemmae common, at the tips of the lobes of the leaves, 3-4-angled, 1-2-celled, bluish green to yellowish green or reddish brown, 15-24 μ . Underleaves wanting on sterile shoots. Plants unisexual; male and female plants in the same or in separate patches. Male plants more slender; male inflorescence terminal or intercalary on an ordinary shoot; male bracts closely imbricate, 30 or fewer, smaller than the leaves, more deeply lobed



Lophozia confertifolia. 1, Cross section of perianth, x 20. 2-3, Leaves, x 8.5. 4, Two bracts and the bracteole (o), x 8.5. 5, Part of sterile plant, dorsal view, x 8.5. 6, Tip of shoot with perianth, x 8.5. 7, Leaf cells, x 203. 8, Tip of shoot with sporophyte, x 15.2. (1, 8, after Meylan; 2-6, after K. Mueller; 7, after Macvicar.)

than the leaves, at base spherically saccate; antheridia usually 2. Female inflorescence terminal on an ordinary shoot; female bracts larger than the leaves, erect-spreading, 2-lobed or rarely 3-lobed for $\frac{1}{4}$ - $\frac{1}{3}$ their length, the lobes subacute, the sinus mostly acute; bracteole about $\frac{2}{3}$ as long as the bracts, oblong to lingulate, occasionally 2-lobed, united far up with one of the bracts and only slightly with the other so that one bract may appear to be 3-lobed and the bracteole wanting. Perianth oblong-ovoid to pyriform, about 1.7 mm long and 0.8-1 mm in diameter, deeply plicate to near the base, 3 cells thick below, then 2 cells thick except the upper $\frac{1}{4}$, green except for the hyaline teeth of the mouth, contracted acutely to roundedly to mouth; mouth about half as wide as the perianth, shortly lobed, toothed, the teeth 1-2 or rarely 3 cells long. Sporangium oblong-ovoid, dark reddish brown; epidermal cells with nodular thickenings; inner layer with semiannular thickenings. Elaters 7-9 μ thick; spirals 2, chestnut brown. Spores 12-15 μ , verruculose, chestnut brown. The name from *L. confertus*, brought together, and *folium*, leaf; in reference to the rather closely imbricate leaves.—On rather dry soil, on covered boulders, on moors; subalpine.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 314; Macvicar (374) 184, figs. 1-3; Meylan (386) fig. 116.

EXAMINATIONS: B. C. Yoho Valley (Brinkman 687) 1912.—*Que.* Bic. Ramouski (Evans 165) 1915.

TYPE LOCALITY: On the Glungezer near Hall in Tirol, Germany (V. Schiffner) August 29, 1903.

RANGE: Me. (150), N. H. (171), Vt. (244), Que. (178), Alta. (46.2), B. C. (46.1), Colo. (175), N. Mex. (272), Va. (169); Eur. (374).

8. *Lophozia marchica*¹⁸ (Nees) Steph., Bull. Herb. Boissier, Ser. 2, 2:48, 1902; also Sp. Hep. 2:148, 1902.

Jungermannia socia var. *obtusa* Nees Naturg. Eur. Leberm. 2:76, 1836.

Jungermannia marchica Nees Naturg. Eur. Leberm. 2:77, 1836.

Jungermannia polita of Aust., Proc. Acad. Nat. Sci. Phila. 21(1869):220, 1870; not of Nees Naturg. Eur. Leberm. 2:145, 1836.

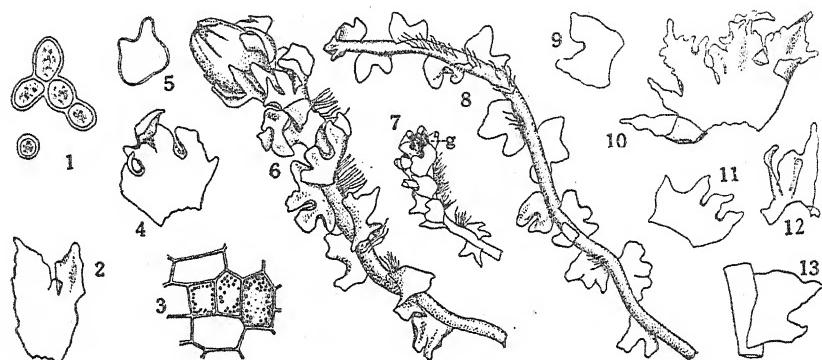
Jungermannia laxa Lindb., Acta Soc. Sci. Fennica 10:529, 1875.

Jungermannia novae-caesareae Evans, Bull. Torr. Bot. Club 20:308, 1893.

L. novae-caesareae Steph., Bull. Herb. Boissier, Ser. 2, 2:161, 1902; also Sp. Hep. 2:153, 1902.

Plants scattered or in small colonies among *Sphagnum* and other mosses of wet situations, yellowish green or slightly tinged with violet above, delicate, tenuous. Stems 2-5 cm long, flexuous, quite purplish on the under side or on both sides, unbranched or branched, commonly with flagelliform branches from beneath the perianth; in cross section the cells thin walled except that the epidermal ones are somewhat thicker walled, up to 4 cortical layers dark violet. Rhizoids moderately abundant, quite purplish at their basal part. Leaves quite distinctly succubous, dorsally somewhat decurrent, distant, widely and rather horizontally spreading, simply 2-5-lobed but mostly 2-lobed, quite variable, rectangular in general outline, 1½-2 times as wide as long or rarely as long as wide, quite delicate; margin entire except for the apical lobes, or sometimes with one or more enlargements grading from sinuations to small lobes; lobes broadly ovate, divergent, acute to obtuse or mostly rounded, often with recurved margins; sinuses descending ⅓-⅔ the leaf length, rounded to mostly crescentic, gibbose. Cells of the leaf middle 40-50 μ , of the lobes about 35 μ , polygonal; walls thin; trigones wanting; cuticle smooth. Gemmae in masses on the tips of the upper leaves, spherical or ovoid, 1-celled, about 16 μ , green. Underleaves wanting. Plants unisexual; both inflorescences terminal. Male plants more tenuous and delicate, about 3 cm long; male inflorescence later growing into a hair-like shoot with distant rudimentary leaves; male bracts 8-12, 2-lobed, the dorsal lobe incurved toward the axis; antheridia 1-2; paraphyses none. Female bracts succubous, 3-lobed, like the leaves; the lobes lanceolate, small; the sinuses deep. Perianth clavate or elongated-ovoid, about 3 mm long and 1.5 mm wide, emergent for most of its length, light green, plicate only near the somewhat con-

¹⁸ märk' i kä, if derived from Neumark.



Lophozia marchica. 1, A single gemma and a group of four, x 381. 2, Female bracteole, x 9.3. 3, Leaf cells, x 127. 4, Leaf immediately below female bract, x 9.3. 5, Cross section of perianth in upper fourth, x 9.3. 6, Shoot with perianth, dorsal view, x 7.6. 7, Shoot with gemmae (g), x 5.3. 8, Sterile shoot, ventral view, x 7.6. 9, Leaf from basal region of shoot, x 10.6. 10, Female bract, x 9.3. 11, Leaves from upper part of shoot, x 10.6. 12, Underleaf immediately below the female bracteole, x 9.3. 13, Leaf of sterile stem, attached, dorsal view, x 30. (1, 3, 9, 11, after Warnstorf; 2, 4-6, 8, 10, 12, after Evans; 7, after Jensen; 13, after Haynes.)

tracted mouth; mouth with short blunt 1-celled teeth. Sporangium ovoid, small, reddish brown, its wall of 3-4 layers of cells; epidermal cells with reddish brown nodular thickenings; innermost layer of wall with semi-annular thickenings. Elaters about 8μ thick; spirals 2, light red. Spores 13-18 μ , papillose, reddish brown. We do not know the derivation of the name; possibly from Neumark, the point of the original collection.—In wet places among *Sphagnum* and other mosses; on wet sandy soil.

ILLUSTRATIONS: Evans, Bull. Torr. Bot. Club 23: pls. 254-255, 1896; K. Mueller (409) 1: figs. 320-321; Warnstorf (523) 204, fig. 4; Haynes, Bryologist 9: pl. 9, figs. 1-4, 1906; Meylan (386) fig. 105.

EXAMINATIONS: Conn. Bethany (Lorenz 996) 1912; Milford (Lorenz 498) 1908.—Me. Mt. Desert (Greenwood 113) 1926.—Mass. Boston (Clarke) 1907.—N. H. Waterville (Lorenz 948) 1911.—N. J. Fairmount (A. Dantum) 1908.—Vt. Franklin (Lorenz) 1908.

TYPE LOCALITY: "In der Neumark um Stolzenberg bei Landsberg an der Warthe," Germany (von Flotow) 1822. Landsberg is about Lat. $52^{\circ} 45'$ N., Long. $15^{\circ} 10'$ E.

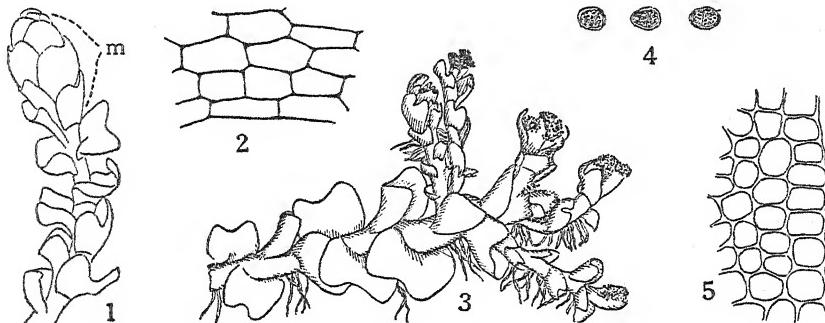
RANGE: Ellesmere Island (56.01), Me. (369.1), N. H. (359), Vt. (203), Mass. (9), Conn. (126), N. J. (128), Del. (212), W. Va. (466), Mich. (446.1), Minn. (97); Eur. (523).

Stephani (491) does not distinguish between *L. marchica* and *L. mildeana*, and of the two the former takes precedence. Evans (139) accepts Stephani's view. Curiously, while named by Nees (410) in 1836, the species is not given in Gottsche, Lindenberg & Nees (226) 1844-1847. Named material of these species needs careful checking to determine which of the species is represented. This leaves the range of the two much more uncertain than of most species.

9. *Lophozia jenseni*¹⁴ K. Muell., Rabenh. Krypt.-Fl. 6(1):685, 1910.

Jungermannia globulifera C. Jensen, Medd. om Groenland 30:306, 1906. Not Roth, Tent. Fl. Germ. 3:379, 1803.

Plants in small loose patches, reddish to blackish brown; leafy shoots about 260 μ wide. Stems up to 8 mm long, suberect to erect, unbranched or branched above, moderately fragile; the epidermal cells rectangular, thinly walled, reddish. Rhizoids numerous, colorless. Leaves succubous but almost transversely inserted, not decurrent; rather distant to somewhat imbricate, spreading to dorsally secund, simply 2-lobed, roundish rectangular to circular but rather wider than long, up to 420 μ long and 650 μ wide, strongly concave adaxially or some of them somewhat flattish; margin entire except for the apical lobes; lobes triangular to ovate, obtuse to rounded, incurved toward the stem, equal or the dorsal one the smaller, often connivent; sinus descending $\frac{1}{4}$ - $\frac{1}{2}$ the leaf length, right-



Lophozia jenseni. 1, Plant with male (*m*) inflorescence, $\times 11.6$. 2, Epidermal cells of the stem in surface view, $\times 200$. 3, Gemmiparous plant, $\times 16$. 4, Gemmae, $\times 200$. 5, Cells along margin of leaf lobe, $\times 200$. (All after Jensen.)

angled or obtuse. Cells of the leaf middle 20-30 μ , of the lobes 18-26 μ ; walls thin; trigones wanting to moderate in size, cuticle smooth. Gemmae very numerous, in masses on the apical half of the crowded upper leaves so the whole constitutes a bud-like tip, spherical to ovoid, not angular, 1-2-celled, 17-22 μ , thin walled, yellowish red. Underleaves wanting. Plants unisexual. Male plants somewhat smaller than the others, in separate patches; male inflorescence terminal, ovate; male bracts larger than the leaves, densely imbricate, 2-lobed, saccate at base, wider than long; the lobes roundish, equal; the sinus shallow, obtuse; antheridia 2. Female inflorescence and sporophyte unknown. Named in honor of C. Jensen, who first named it but chose a name already occupied.—On sandy soil; in swampy places.

¹⁴ jěn' sěn i.

ILLUSTRATIONS: Jensen, Medd. om Groenland 30:307-308, figs. 1-5, 1906.

EXAMINATIONS: None.

TYPE LOCALITY: Kingorsuak and Sierak Dal, East Greenland (Kruuse).

RANGE: So far as we are aware it is known only from the original Greenland collection.

10. *Lophozia violascens*¹⁵ Bryhn & Kaal., Bryhn in Rept. 2nd Norwegian Arctic Exped. in "Fram" in 1898-1902, 11:36, 1906.

Plants in small intricate patches or singly between mosses, brownish purple to violet, or toward the tip whitish green. Stems 1-1.5 cm long, erect, unbranched, comparatively thick and fleshy but firm, 200-400 μ thick near tip, the lower part brownish purple, the upper part violescent or sometimes whitish green, composed of thin walled cells up to 28 μ wide and 70-100 μ long. Rhizoids numerous, long, colorless. Leaves transversely inserted, not decurrent, distant below to contiguous above, erect spreading toward base, loosely appressed toward tip, simply somewhat 2-lobed, quadrate to roundish quadrate, the lower ones hardly wider than the stem, gradually larger up the stem, averaging about 600 μ long except the lowest, concave, the tip slightly incurved, violescent; apex truncate or usually emarginate; margin entire or the upper leaves occasionally erose through the formation of gemmae; lobes short, obtuse to very rarely acute, frequently unequal with the dorsal one the smaller; sinus merely an emargination or rarely deeper, crescentic to rounded or deep and acute. Cells of the leaf middle 30-35 μ , of the apex 25-30 μ , quadrate to polygonal, usually hyaline; walls thin; trigones minute; cuticle smooth to minutely striate. Gemmae on the erose margins of the upper leaves, rare, ovoid, large, violescent. Underleaves usually wanting, sometimes present among the upper leaves, small, subulate. Otherwise unknown. The name the *L. violascens*, tending to be like a violet; in reference to the violescence of the plant.

ILLUSTRATIONS: None.

EXAMINATIONS: None.

TYPE LOCALITY: Havnefjord, on the south shore of Ellesmere Island, the locality first mentioned by Bryhn & Kaalaas, may be considered the type locality. It is about Lat. 76° 30' N., Long. 84° 10' W.

RANGE: Ellesmere Isl. (56.01), Pim Isl. (about Lat. 78° 44' N., Long. 74° 39' W.) (56.01).

It may be remarked here that it is highly desirable that descriptions of new plants be fully figured from the original material. Often accurate detailed illustrations show characters not mentioned in the description, and occasionally undescribed but figured characteristics prove in the course of years to be of more diagnostic value than the original description. There are, indeed, few descriptions so accurate

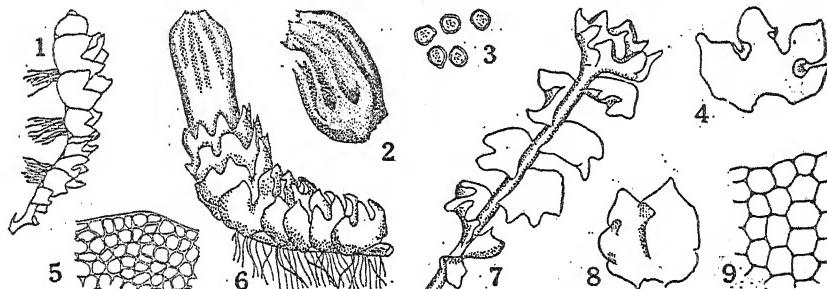
¹⁵ vi ö lä's' sěns.

that one could visualize the plant in sufficient detail to make a recognizable drawing of it. Usually there is only one package of type material, while many copies of the drawings appear and are distributed all over the world. If a plant is worth describing, it is worth detailed illustration; if it should not have been described as new, the figures would go far to show its synonymy.

11. *Lophozia mildeana*¹⁶ (Gottsche) Schiffn., Lotos 51(7):54, 1903.

Jungermannia mildeana Gottsche, Verh. Zool.-Bot. Gesell. Wien 17:626, 1867.
Jungermannia mildei Kaal., Nyt. Mag. Naturvid. 33:333, 1893.

Plants in patches or mats, yellowish green to reddish brown or with a violet tinge. Stems 1-3 cm long, prostrate to ascending or erect, often branched from beneath the inflorescence, the tips capitate in appearance, light green; in cross section circular, the interior cells large and thinly walled, the epidermal cells somewhat thicker walled and specially the exterior often with purplish walls. Rhizoids numerous, long, colorless. Leaves distinctly succubous, not decurrent, distant below to rather closely imbricate above, spreading rather horizontally below, dorsally secund above, simply 2-5-lobed, mostly 2-lobed on sterile stems, quadrate to reni-



Lophozia mildeana. 1, Side view of shoot, x6.6. 2, Perianth, x9. 3, Gemmae, x106. 4, Leaf, x15.8. 5, Cells along leaf margin, x53. 6, Part of plant with perianth, x10.6. 7, Part of sterile plant, dorsal view, x10.6. 8, Leaf, x15.8. 9, Leaf cells, x87. (1, 9, after Jensen; 2, after Gottsche; 3-8, after K. Mueller.)

form in general outline, 1-2 mm wide, quite thin and flaccid, bright green or often somewhat violet, quite undulate, on the lower portion of the stem the insertion reaching the middle dorsally, on the upper part of fertile stems the insertion extending entirely across the stem dorsally; margin except for apical lobes entire to sinuate, often revolute; lobes broadly lanceolate or shorter, irregularly unequal, the tips rounded to acuminate but mostly somewhat bluntly acute; sinuses descending about $\frac{1}{3}$ the leaf length, rather narrowly rounded, gibbose. Cells of the leaf middle and margin 30-45 μ , of the leaf tips about 33 μ , of the base 33-35 μ , more than usually translucent, polygonal; walls thin to a bit thickish; trigones none

¹⁶ mil dē z' nā.

or minute; cuticle smooth. Gemmae in spherical masses, on the tips of the upper leaves of etiolate branches, globular or ellipsoid to pyriform, 1-celled, about 25μ , thinly walled. Underleaves wanting except among the female bracts. Plants unisexual; both inflorescences terminal. Male plants intermingled with the female or in separate patches, smaller, almost always with violet tinge; male inflorescence short; male bracts transversely inserted, almost saccate, 2-lobed, the lobes curved inward toward the axis; antheridia 1-2. Female bracts larger and more closely imbricate than the leaves, 2-5-lobed, wider than long, crispatate in appearance; the lobes mostly acute, sometimes sparingly toothed; bracteole lanceolate, lobed. Perianth clavate to cylindric, up to 4 mm long and 2 mm thick, about $\frac{3}{4}$ -emergent, often tinged with violet, the upper half or more with 8 blunt plicae, somewhat roundedly narrowed to the mouth; mouth rather wide, lobed, toothed; the teeth 2-3 cells long, soon deciduous. Seta rather long, delicate. Sporangium ovoid, blackish brown to blackish red; the wall of 4-6 layers of cells; epidermal cells very large, with nodular thickenings; innermost layer with semiannular thickenings. Elaters about 10μ thick; spirals 2, reddish violet. Spores 12-17 μ , verruculose, reddish violet. Named in honor of the original collector, Dr. J. Milde.—On sandy or peaty soil in wet places; among *Sphagnum*.

ILLUSTRATIONS: Gottsche, Verh. Zool.-Bot. Gesell. Wien 17: pl. 16, 1867; K. Mueller (409) 1: fig. 319; Warnstorff (523) 209, fig. 1; Jensen (323.5) 117, 3 figs.; Ammons (3.1) 141, fig. C.

EXAMINATIONS: Ohio. Lick Hill in Hocking County (Taylor) 1927.—Pa. Delaware County (M. A. F. K. Knout) 1914.—R. I. Westerly (Lorenz) 1924.

TYPE LOCALITY: Near Hasenau, in the vicinity of Breslau, Silesia, Germany (Dr. J. Milde), June 17, 1866.

RANGE:¹⁷ Me. (169), N. H. (159), Vt. (203), Pa., Ohio (97), Mich. (3.1), Fla. (201), W. Va. (159), Del. (159), N. J. (159), Conn. (159), R. I. (200), Mass. (169); Eur. (225.1).

12. *Lophozia wenzelii*¹⁸ (Nees) Steph., Bull. Herb. Boissier, Ser. 2, 2:35, 1902; also Sp. Hep. 2:135, 1902.

Jungermannia wenzelii Nees Naturg. Eur. Leberrn. 2:58, 1836.

Jungermannia groenlandica G. L. & N. Syn. Hep. 114, 1844.

Sphenolobus groenlandicus Steph., Bull. Herb. Boissier, Ser. 2, 2:172, 1902; also Sp. Hep. 2:164, 1902.

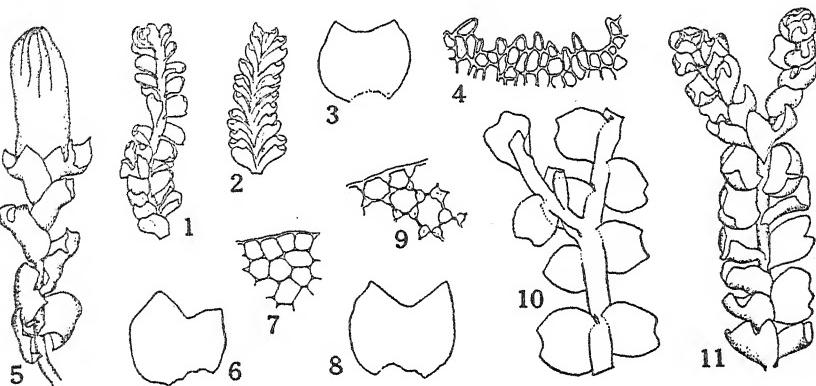
L. groenlandica of Macoun Cat. Canadian Pls. 7:19, 1902. Not of Bryhn, Nytt. Mag. Naturvid. 47:287, 1909.

Plants in spongy tufts, yellowish green to yellowish brown; leafy shoots about 1.5 mm wide. Stems up to 1-6 cm long, erect, somewhat flexuous, soft, the older portion reddish purple, the younger portion pale

¹⁷ In North America *L. mildeana* was not distinguished from *L. marchica* for many years. Reports of *L. mildeana* before 1908 may be either one. Thus Evans (159, 169, 203) reports *L. mildeana* in a considerable number of Eastern states, including Connecticut, but later (212) reports *L. marchica* from Connecticut but not *L. mildeana*.

¹⁸ wén' zé lí i. K. Mueller (409) and Gil (76) spell it with one final "i".

green above and reddish purple beneath except near the tip, usually unbranched but sometimes forked at tip. Rhizoids rather few, almost wanting toward the stem tip, long, colorless but usually becoming reddish purple at their bases. Leaves distinctly succubous, obliquely shortly decurrent, rather distant to contiguous, erect-spreading to spreading, somewhat secund dorsally, simply 2-lobed or rarely 3-lobed, broadly ovate or obovate to almost circular, wide, flaccid, tinged with red at apex, adaxially concave; margin entire except for the lobes; lobes often unequal, triangular to ovate-triangular, obtuse to rounded, rarely subacute to apiculate, usually incurved; sinus descending $\frac{1}{5}$ - $\frac{1}{4}$ the leaf length, acute to usually crescentic. Cells of the leaf middle 23-30 μ , of the margin slightly smaller,



Lophosia wenzelii. 1-2, Tips of sterile shoots, x 45. 3, Leaf, x 16. 4, Part of mouth of perianth, x 106. 5, Shoot with perianth, x 10.6. 6, Leaf, x 16. 7, Leaf cells in normal dampness, x 146. 8, Leaf, x 16. 9, Leaf cells in drier situation, x 146. 10, Part of sterile plant, ventral view, showing origin of branch, x 9. 11, Part of sterile stem, x 10.6. (1-2, 7, 9, after Buch; 3-6, 8, 11, after K. Mueller; 10, after Evans.)

of the lobes 20-25 μ , rounded-hexagonal, opaque; walls slightly thickened, usually yellowish; trigones small to medium; cuticle smooth. Gemmae at the leaf tips, 4-8-angled, irregular in form, about 20 μ , 2-celled, thin walled, yellowish green. Underleaves wanting. Plants unisexual; both inflorescences terminal. Male plants smaller, more densely leafy; male bracts 10-14, adaxially concave, deeply 2-3-lobed; antheridia 1-2; paraphyses wanting. Female inflorescence terminal; female bracts little larger than the leaves, adaxially concave, erect-spreading, often united by their basal edges, 2-3-lobed; their lobes more obtuse and incurved than in the leaves; their sinuses descending about $\frac{1}{4}$ the bract length; bracteole usually united with one of the bracts, ovate, small, acutish to obtuse, the free part spreading. Perianth free from the bracts, $\frac{3}{4}$ - $\frac{4}{5}$ -emergent, cylindrical to oblong-cylindrical or ovoid, about 3 mm long and 1 mm wide,

4-5-plicate toward tip, obtusely or roundedly contracted to the mouth; mouth shortly 4-5-lobed, the lobes denticulate. Seta about 1 cm long. Sporangium ovoid, reddish brown, its wall several cells thick. Elaters Sporangium ovoid, reddish brown, its wall several cells thick. Elaters about 150 μ long, 6-7 μ thick; spirals 2, reddish brown. Spores about 10 μ , muriculate, dark brown. Named in honor of Wenzel, a German druggist, who accompanied Nees on some of his collecting trips.—On wet ground and rocks, in alpine regions and the far north.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 312; Jensen, Kgl. Vetenskaps Akad. Foerhandl. 57:800, figs. 1-15, 1900; Macvicar (374), 187, figs. 1-4; Meylan (386) fig. 117; Evans, Ann. Bot. 26:14, figs. 17-18, 1912; Buch, Annales Bryol., 6:9, figs. 1-4, 1933.

EXAMINATIONS: None.

TYPE LOCALITY: "Koppenplan im Riesengebirge," between Germany and what was Czechoslovakia (von Flotow) 1824.

RANGE: Greenland (322), Pim Isl. (56.01), Ellesmere Isl. (409), Southampton Isl. (277.2), District of Keewatin (485.6), Yukon (51); Asia (350); Eur. (374); Spitzbergen (409).

Jensen (Medd. om Groenland 30:306, 5 figs. on 305, 1906) publishes a new variety, *Jungermannia alpestris* var. *major*. This may fall under *Lophozia wenzelii*. Jensen fails to describe it except that it is larger than *Jungermannia alpestris* and has larger leaf cells. His figures indicate that his plant differed from *L. wenzelii* in the possession of the following: Leaf lobes acute to obtuse; cells of the leaf middle 43-60 μ , cells of the leaf lobes 20-43 μ ; female bracts about the same size as the normal leaves of sterile stems; perianth wholly exserted. Jensen's material grew in East Greenland.

13. *Lophozia porphyroleuca*¹⁹ (Nees) Schiffn., Lotos 51(7):61, 1903.

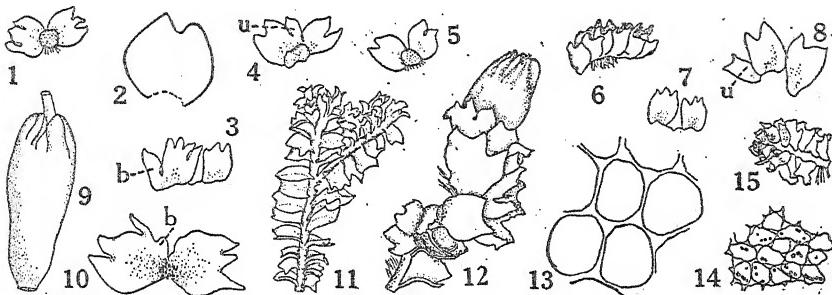
Jungermannia porphyroleuca Nees Naturg. Eur. Lebem. 2:78, 1836.

Jungermannia ventricosa var. *porphyroleuca* Hartm. Skand. Fl., Ed. 10, 2:138, 1871.

L. ventricosa var. *porphyroleuca* K. Muell., Rabenh. Krypt.-Fl. 6(1):666, 1910.

Plants in patches, whitish green to yellowish green or reddish brown. Stems 0.3-1.5 cm long, prostrate to erect, reddish on the under side, simple or forked, frequently innovating beneath the female inflorescence. Rhizoids numerous, long, colorless, present to near the tip of the stem. Leaves succubous but almost transversely inserted, not decurrent, distant to imbricate, erect-spreading, simply 2-lobed, orbicular, 500-800 μ long; margin entire except for apical lobes; lobes equal or nearly so, triangular-ovate, acute, reflexed at margin; sinus obtuse, spreading. Cells of the leaf middle 25-35 μ , of the margin and tips 24-26 μ , of the base 30-40 μ , rounded-polygonal; walls thin, often pigmented; trigones large, bulging into the cells; cuticle smooth or papillose. Gemmae sometimes wanting, often quite common, in spherical groups at the tips of the lobes of the upper leaves, irregularly three- to many-angled, 1-2-celled, yellowish green. Underleaves rare except among the female bracts, subulate, 160-

¹⁹ pôr" fi rô lü' kâ.



Lophozia porphyroleuca. 1, Large leaves below the female bracts, $\times 4.5$. 2, Leaf, $\times 12$. 3, Female bracts, and bracteole (*b*), $\times 4.5$. 4, Leaves and underleaf (*u*) just beneath female bracts, $\times 4.5$. 5, Normal leaves, $\times 4.5$. 6, Part of sterile shoot, $\times 11.7$. 7, Leaves close to female bracts, $\times 4.5$. 8, Leaves and underleaf (*u*) near female bracts, $\times 4.5$. 9, Perianth, $\times 9$. 10, Female bracts and bracteole (*b*), $\times 6.4$. 11, Leafy shoot, dorsal view, $\times 4.5$. 12, Tip of shoot with perianth, $\times 11.7$. 13, Cells of the leaf middle, $\times 500$. 14, Leaf cells, $\times 194$. 15, Male inflorescence, $\times 11.7$. (1, 3-5, 7-10, after Pearson; 2, 13, original, by Elsie K. Waddingham; 6, 12, 14-15, after Lorenz; 11, after Buch.)

200 μ long, 80-160 μ wide. Plants unisexual; both inflorescences terminal. Male bracts with 2-3 shortly stalked antheridia. Female bracts 4, similar to the leaves but larger, more concave adaxially, 3-4-lobed, the sinuses obtuse; bracteole bifid to entire, united with one or both bracts. Perianth cylindric, 1-1.5 mm long, about $\frac{1}{2}$ -emergent, the lower half reddish, the upper $\frac{1}{3}$ - $\frac{1}{2}$ plicate, rounded to the mouth; mouth with several lobes; the lobes acute, unequally ciliate-dentate; the teeth 1-4 cells long. Sporangium elliptic, 1.1-1.25 mm long, brown. Elaters with 2 brown spirals. Spores 8-12 μ , verruculose, brown. Name from Gk. *porphyra*, purple, and *leucos*, white; in reference probably to the purplish white stems and leaf bases.—On rotting wood, on peaty soil.

ILLUSTRATIONS: Haynes, Bryologist 11: pl. 1, figs. 10-14, 1908; Pearson (433) 2: pl. 141, figs. 1-8; Macvicar (374) 180, figs. 1-4; Meylan (386) fig. 114.

EXAMINATIONS: Alaska. Douglas (Clark) 1909; Taku Inlet (Frye) 1913.—*Alta.* Banff National Park (Rakestraw) 1937.—*B. C.* Morrissey (Elizabeth Knox) 1937.—*Cal.* Mt. Lassen National Park (Rakestraw) 1936.—*Ida.* Moscow Mt. (Clark) 1923.—*Mont.* Henderson (Frye) 1925; St. Ignatius (Frye) 1934.—*N. Y.* Lake Placid (Britton) 1898.—*Utah.* Mirror Lake (Flowers 2119) 1927; Uintah (Flowers) 1927.—*Vt.* Willoughby (Lorenz) 1904.—*Wash.* Friday Harbor (Clark) 1925; Mt. Rainier (Svhla 358) 1931.—*Wyo.* Dubois (Frye) 1931, Yellowstone National Park (Frye) 1931.

TYPE LOCALITY: European.

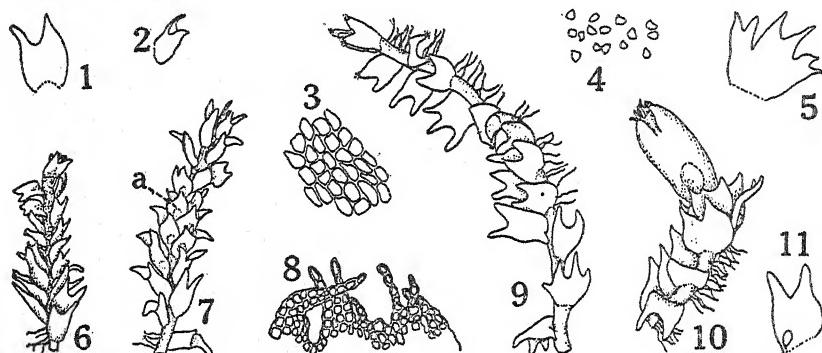
RANGE: Greenland (248), Ellesmere Isl. (56.01), N. S. (53.2), Me. (369.1), N. H. (262), Vt. (150), Mass. (164), Conn. (150), N. Y., Que. (178), Ont. (373), Mich. (502), Wis. (94.1), Colo. (175), Wyo. (445), Mont. (81), Alta. (48), Yukon (51), Alaska (173), B. C. (371), Ida. (80.1), Wash. (81), Ore. (457), Cal. (84.1), Utah; Asia (350); Eur. (325); Spitzbergen (524.3).

14. *Lophozia longidens*²⁰ (Lindb.) Macoun Cat. Canadian Pls. 7:18, 1902.

Jungermannia porphyroleuca var. *attenuata* Nees Naturg. Eur. Leberm. 2:80, 1836.

Jungermannia longidens Lindb., Musci Scand. 7, 1879.

Plants in small compact tufts or among mosses, dark green, sometimes tinged with brown above. Stems 1-3 cm long, ascending to suberect, uniformly green to pale brownish beneath, usually unbranched, sometimes innovating below the female inflorescence. Rhizoids not very numerous, long, colorless, present to near apex of stem. Leaves quite succulently inserted, shortly decurrent dorsally, somewhat distant to contiguous, spreading, often somewhat horizontal, usually simply 2-lobed but sometimes 3-lobed, ovate-quadrangular to ovate-rectangular, slightly oblique; margin entire except for the apical lobes, the dorsal one often recurved; lobes narrowly triangular, spreading, acute to narrowly rounded; sinus descending $\frac{1}{4}$ - $\frac{1}{2}$ the leaf length, obtuse to crescentic. Cells of the leaf middle 25-30 μ , of the margin and apex 20-25 μ , of the base 27-32 μ , polygonal; walls thin; trigones minute; cuticle smooth. Gemmae in clumps on the tips



Lophozia longidens. 1, Leaf, x 30. 2, Male bract, x 30. 3, Cells of leaf middle, x 152. 4, Gemmae, x 152. 5, Female bract, x 30. 6, Old male inflorescence, x 30. 7, Male inflorescence with antheridia (a), x 30. 8, Part of mouth of perianth, x 152. 9, Leafy shoot, x 30. 10, Shoot with perianth, x 30. 11, Male bract with antheridium, x 30. (All after Lorenz.)

of the upper leaves, 20-25 μ , many-angled, 1-2-celled, yellowish brown to reddish brown or green. Underleaves wanting or very rare except among the female bracts, very small, lanceolate. Plants unisexual. Male plants often in separate tufts, branches more frequent, leaves closer and less spreading; male inflorescence terminal; male bracts 12-16, imbricate, transversely inserted, wide and saccate at base; antheridia 1 or usually 2, ovoid-globose, on a stalk half as long. Female bracts as large as the leaves or slightly larger, erect-spreading, irregularly and unequally 2-5-lobed, concave on the adaxial side, usually the margin with some short

²⁰ lōn' jī dēns.

teeth; the lobes narrow, acute; bracteole lingulate, entire or toothed, united with one of the bracts for much of its length. Perianth obovoid to clavate, about $\frac{3}{4}$ -emergent, several cells thick in lower part, 5-7-plicate above where roundedly narrowed to the mouth; mouth with 5-7 small lobes, dentate-ciliate and ciliate; its teeth of 1-6 long cells. Seta about 1 cm long. Sporangium ovoid-oblong, yellowish brown, its wall of 2 layers of cells; epidermis with nodular thickenings; inner layer of cells with semiannular thickenings. Elaters $8\ \mu$ thick; spirals 2, reddish brown. Spores $10-13\ \mu$, verruculose, yellowish brown. Name from *L. longus*, long, and *dens*, tooth; in reference to the long teeth on the mouth of the perianth.—On soil of banks, on rocks, on rotten wood; subalpine.

ILLUSTRATIONS: Lorenz, Bryologist 13: pl. 3, 1910; K. Mueller (409) 1: fig. 308; Macvicar (374) 178, figs. 1-5; Meylan (386) fig. 113.

EXAMINATIONS: Alta. Waterton Park (Rakestraw) 1937.—B. C. Halcyon Hot Springs (MacFadden 1037) 1928; Yoho Glacier (Brinkman 683) 1912.—Colo. Independence Pass (Rakestraw) 1938.—Ida. Moscow (Clark) 1923.—Mich. Isle Royal (Allen) 1901.—Minn. Grand Portage in Cook County (Conklin 3122) 1937.—Mont. Glacier National Park (Frye) 1934.—N. H. Waterville (Lorenz) 1908.—N. Y. Little Moose Lake in Herkimer County (Haynes) 1910.—Ore. McKenzie Pass (Rakestraw) 1938.—Vt. Willoughby (Lorenz) 1915.—Wash. Republic (Foster) 1912.

TYPE LOCALITY: European.

RANGE: N. S. (413), Me. (369.1), N. H. (359), Vt. (185), Conn. (203), N. Y., Que. (178), Mich. (419.01), Wis. (94), Minn. (94.1), Colo., Mont. (82), Alta. (46.2), B. C. (157), Ida. (80.1), Wash. (83), Ore.; Asia (350); Eur. (329); Spitzbergen (524.3); King Charles Isl. (409).

15. *Lophozia incisa*²¹ (Schrad.) Dum. Rec. d'Obs. 17, 1835.

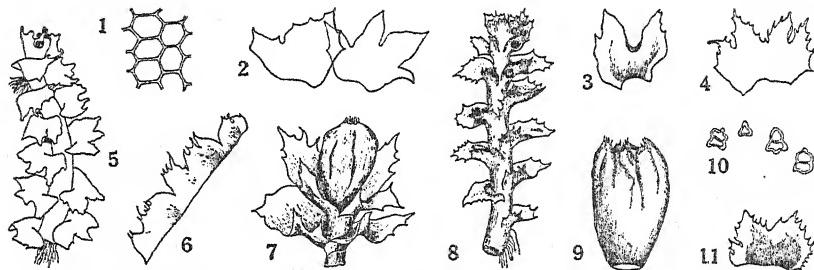
Jungermannia incisa Schrad. Syst. Samml. Krypt. Gewächse 2:5, 1796. Not of Taylor in London Jour. Bot. 4:93, 1845.

Jungermannia viridissima Nees Naturg. Eur. Leberm. 2:134, 1836.

Plants in patches, bluish green. Stems 0.4-1 cm long, prostrate to ascending, forked at the tip or with few or no branches, green, wider than thick, about 14 cells wide and 9-10 cells thick, ventral cortical cells thickly walled, the interior cells thinly walled. Rhizoids numerous, long, colorless, present to tip of stem. Leaves almost transversely inserted but inclined to be succubous rather than incubous, not decurrent, the lower distant, the upper somewhat imbricate, erect-spreading to horizontally spreading, the upper forming a crowded head at the tip of the stem, simply 2-lobed or toward the perianth up to 5-lobed, rhomboidal, 0.7-1.8 mm long, 0.5-1.7 mm wide, roundedly concave adaxially, about half embracing the stem, the upper plicate-crispate; margin crispate, dentate to spinose-dentate; lobes unequal, dentate to spinose-dentate, acute to obtuse, the ventral distinctly the larger; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, acute to rounded. Cells of the leaf middle 30-40 μ , of the margin about 25 μ ,

²¹ In sif. sä.

roundish quadrate, opaque because of the many chloroplasts and the oil bodies; walls thin; trigones small, distinct; oil bodies numerous; cuticle smooth. Gemmae in clusters at the tips of the lobes of the leaves, irregularly 3-5-angled, 1-2-celled, yellowish green, about 15μ . Underleaves wanting, or sometimes present among the upper leaves, lanceolate to



Lophozia incisa. 1, Leaf cells, x 127. 2, Leaves, x 10.6. 3, Leaf, x 10.2. 4, Female bract, x 8.5. 5, Gemmiparous shoot, x 5.3. 6, Mouth of the perianth spread out, x 6.8. 7, Tip of shoot with perianth, x 8.5. 8, Male shoot, x 6.8. 9, Perianth, x 6.8. 10, Gemmae, x 127. 11, Male bract, x 10.2. (1-2, 10, after Warnstorff; 3, 6, 8-9, after Pearson; 4, 7, after K. Mueller; 5, after Jensen.)

subulate. Plants unisexual; both inflorescences terminal. Male bracts forming a crowded head, ventricose, 3-lobed and an additional smaller basal incurved lobe on each margin, dentate; antheridia 1-2, globose, with very short stalk; paraphyses wanting. Female bracts larger than the leaves, longer than wide, irregularly 3-5-lobed to about $\frac{1}{2}$ the bract length, crispat, the lobes spinose-dentate; bracteole wanting or lanceolate, free from the bracts. Perianth narrowly ovoid to pyriform, about $\frac{1}{2}$ -emergent, 5-plicate near apex, several cells thick below, slightly to roundedly narrowed to mouth; mouth with 4-5 irregular segments, ciliate-dentate, the cilia 1-3 cells long. Seta very short. Sporangium ovoid, reddish brown with carmine valves, its wall of 3 layers of cells; epidermal cells with nodular thickenings; innermost layer with semiannular thickenings. Elaters 80-145 μ long, 8-10 μ thick; spirals 2, reddish brown. Spores 10-15 μ , finely verruculose, brown. The name the *L. incisus*, cut; apparently in reference to the cleft leaves.—On peaty soil and decaying wood.

ILLUSTRATIONS: Pearson (433) 2: pl. 144; K. Mueller (409) 1: fig. 323; Hooker (285) pl. 10; Jensen (323.5) 117, 3 figs.; Ekart (124) pl. 4, fig. 30, and pl. 10, fig. 77; Macvicar (374) 192, figs. 1-4; Warnstorff (523) 1: 204, fig. 3; Meylan (386) fig. 110; Douin, Bull. Soc. Bot. France 60: pl. 12, figs. 29-34, 1913.

EXAMINATIONS: Alaska. Douglas (Clark) 1909.—*Alta*. Laggan (Macoun 67) 1904.—*B. C.* Shell Island in Queen Charlotte Sound (Frye) 1913.—*Cal.* Smith River (Rakestraw) 1938.—*Colo.* Rocky Mountain National Park (Kiener 5812) 1937.—*Ida*. Moscow (Clark) 1923.—*Ky.* Natural Bridge (Taylor 60) 1925.—*Me.* Flint Island (collector unknown) 1927.—*Mass.* Worcester (Greenwood) 1908.—*Mich.* Cheboygan (Ammons 277) 1931.—*Minn.* Duluth (Conklin 1663) 1912.—*Mont.* Hen-

derson (Frye) 1925.—*N. H.* Alstead (Greenwood 274) 1935.—*N. Y.* Little Moose Lake in Herkimer County (Haynes) 1906.—*N. S.* Cape Breton Island (Nichols 36) 1909.—*Ohio*, Hocking County (Taylor) 1921.—*Ore.* Prospect (Henderson 12116) 1930.—*Pa.* Ridgeway in Elk County (Lanfear) 1933.—*Que.* Anticosti Island (M. Victorin 19022).—*Vt.* Jamaica (Lorenz) 1901.—*Wash.* Clearwater (Frye) 1931.—*W. Va.* Bald Knob in Pocahontas County (Gray 71140) 1923.—*Wis.* Superior (Conklin 775) 1909.—*Wyo.* Dubois (Frye) 1931.

TYPE LOCALITY: European.

RANGE: Greenland (226), Anticosti (373), Miquelon Isl. (373), N. S. (53.2), N. B. (369), Me. (369.1), N. H. (354.2), Vt. (241), Mass. (232), R. I. (140), Conn. (212), N. Y. (258), Que. (178), Pa. (338), Ont. (373), Ohio, Mich. (502), Wis. (98), Minn. (94.1), Wyo. (445), Mont. (81), Alta. (373), Yukon (373), Alaska (173), B. C. (371), Ida. (81), Wash. (81), Ore. (215), Cal. (84.1), N. Mex. (272), Colo. (175), N. C. (43), Ky. (218), W. Va. (3.2); Mex. (224); Asia (247.08); Eur. (374); Azores (2.075).

GYMNOCOLEA^{}** Dum. Rec. d'Obs. 17, 1835.

Jungermannia section *Gymnocolea* Dum. Syll. Jung. Eur. 52, 1831, in part.
Lophoszia Howe, Mem. Torr. Bot. Club 7:103, 1899, in part.

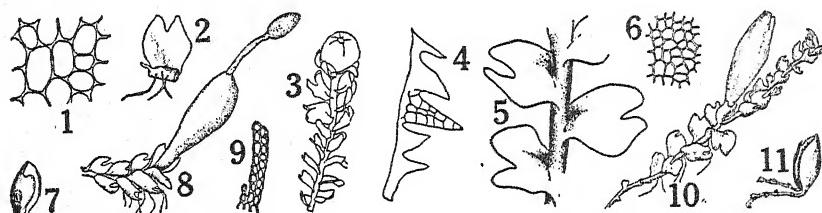
Plants in patches or mats, dull green to yellowish brown or blackish. Stems prostrate to suberect, simple or with few branches, usually 7-8 cells thick; branches chiefly from the axils of modified leaves, but sometimes of normal ones, sometimes from the under side of the stem. Rhizoids few to numerous, hyaline to brownish. Leaves succubous to almost transverse, not or barely decurrent, distant to contiguous, erect-spreading or spreading, simply 2-lobed; lobes acute or mostly obtuse. Cells of the leaf with rather thin walls; trigones none or small. Gemmae unknown. Underleaves rarely present and then among the female bracts or at base of branch. Plants unisexual. Antheridia 1 in each bract axil. Female bracts like the leaves or smaller, spreading from the base. Perianth wholly exserted, clavate-pyriform, smooth, not plicate, contracted at mouth, sterile ones breaking off and forming new plants; mouth quite small, dentate. Seta of large epidermal cells and smaller inner cells. Sporangium oblong-ovoid so far as known, the wall of 2 layers of cells; epidermal layer of large cells, with nodular thickenings; inner layer of small cells, with nodular thickenings. Name from Gk. *gymnos*, naked, and *koleos*, sheath; in reference to the wholly exserted perianth.

Small-leaved branches from the under side of the stem scarce, often from the axils of unlobed leaves; rhizoids scarce; underleaves rare.....1. *G. inflata*.
Small-leaved branches from the under side of the stem rather common, nearly always from the axils of unlobed leaves; rhizoids often numerous to the tip; underleaves often present.....la. var. *heterostipa*.

^{**} jím nō kō' lē à.

1. *Gymnocolea inflata*²³ (Huds.) Dum. Rec. d'Obs. 17, 1835.*Jungermannia inflata* Huds. Fl. Angl. 511, 1762.*Lophozia inflata* Howe, Mem. Torr. Bot. Club 7:110, 1899.

Plants in patches or sods or scattered among *Sphagnum*, green to yellowish brown or blackish brown, with a somewhat oily lustre; leafy shoots about 1 mm wide. Stems 0.6-2 cm long, 90-250 μ thick, prostrate to suberect, unbranched or with a few lateral or latero-ventral branches, often innovating near the base of the perianth. Rhizoids scarce, hyaline to brownish. Leaves succubous or the upper nearly transverse, slightly decurrent dorsally, approximate on upper part of stem to distant on lower, the upper often erect-spreading, the lower horizontal and spreading, concave or those of the lower stem nearly flat, oblong-cuneate or broadly ovate to oblong, 360-900 μ long, 270-800 μ wide; margins entire; lobes ovate, obtuse, often unequal and when so the ventral usually the larger; sinus descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, narrow, obtuse; margin entire or slightly sinuate; those leaves with branches from their axils often narrowed at base, often unlobed. Cells of leaf middle 20-40 μ , of the margin 18-35 μ , of the base hardly larger than of the middle, of the lobes about



Gymnocolea inflata. 1. Cells of the leaf middle, x 134. 2. Leaf and underleaf on piece of stem, x 10. 3. Tip of shoot with sterile perianth, x 4.4. 4. Part of mouth of perianth, x 204. 5. Piece of plant, dorsal view, x 22. 6. Leaf cells, x 62. 7. Male bract, x 8.3. 8. Tip of plant with sporophyte, x 7. 9. Underleaf, x 70. 10. Tip with perianth, x 4.2. 11. Fallen perianth forming 2 shoots, x 4.2. (1-2, 8-11, after K. Mueller; 3, 6, after Jensen; 4, 7, after Pearson; 5, original by Elsie K. Waddingham.)

20 μ , 4-6-angled; walls slightly thickened; trigones none or indistinct; oil bodies 2-5, oval, 5-10 μ ; cuticle smooth or obscurely striolate. Underleaves from scarce to usually wanting, rudimentary to subulate or lanceolate. Plants unisexual. Male plant more slender, the inflorescence terminal or farther down the stem; male bracts 8-12, nearly transversely inserted, wider than long, concave; antheridium 1, globose-ovoid, with a short stalk; paraphyses wanting. Female bracts 2, similar to the leaves, one or both smaller, often more deeply cleft, transversely inserted, concave, widely spreading; bracteole present or wanting, lingulate, sometimes coherent with the bracts. Perianth free from the bracts, oblong-obvoid to

²³ in flā' tā.

pyriform, 2-2.7 mm long, 0.85-1.2 mm thick, longly exserted, often apparently dorsal on account of innovations, obtuse at apex, smooth or the apex faintly plicate, 1 cell thick for $\frac{2}{3}$ - $\frac{3}{4}$ its length; mouth 4-5-lobed, the lobes sparingly dentate. Seta 0.5-1 cm long, its outer cells large, the interior ones smaller. Sporangium oblong-ovoid, the wall of 2 layers of cells; epidermal cells large, with nodular or columnar thickenings; intermediate and inner layers of wall cells small, with semiannular thickenings; valves long, narrow. Elaters 120-180 μ long, 6-10 μ thick, slightly attenuate at both ends; spirals 2, reddish brown. Spores 12-18 μ , granular-papillate, brown. Name the L. *inflatus*, distended with air; probably from the large perianth in comparison with the small leaves.—On wet rocks and wet soil.

ILLUSTRATIONS: Pearson (433) 2: pl. 131; K. Mueller (409) 1: figs. 332-333; Hooker (285) pl. 38; Warnstorf (523) 184, fig. 2; Macvicar (374) 161, figs. 1-3; Ekart (124) pl. 3, fig. 23; Meylan (386) fig. 125; Underwood (506) pl. 25; Gil (76) fig. 245; Jensen (323.5) 139, 3 figs.

EXAMINATIONS: Alaska. Nichols Bay (Frye) 1913.—Alta. Banff (Macoun 353) 1891.—B. C. Glacier (Brinkman 296) 1908.—Me. Grafton in Oxford County (C. D. Adams 13525) 1937.—Mich. Pictured Rocks in Alger County (Steere 734) 1934.—Minn. St. Louis River (E. Hallway 126) 1886.—N. H. Mt. Pleasant (Lorenz) 1904.—N. Y. Ithaca (Holzinger) 1901.—N. C. White Lake in Bladen County (Blomquist 7114) 1935.—N. S. Dartmouth (Brown 211) 1923.—Ont. Belleville (Macoun 50) 1869.—Pa. Gulf Mills (Kaiser) 1910.—Que. Tadousac in Saguenay County (Evans 43) 1915.—S. D. (A. C. McIntosh 229) 1927.—Wash. Hamilton (Foster) 1904.—Wyo. Norris Geyser Basin in Yellowstone National Park (Frye) 1925.—Yukon. Hunker Creek (Macoun 70) 1902.

TYPE LOCALITY: British Isles.

RANGE: Greenland (322), Labrador (373), Newfoundland (510), Miquelon Isl. (431), N. S. (53.2), Me. (333), N. H. (359), Vt. (241), Mass. (185), Conn. (140), N. Y. (58), Que. (178), Pa., Ont. (373), Mich. (418), Minn., S. D., Wyo. (81), Alta. (46.2), Yukon (51), Alaska (173), B. C. (508), Wash. (81), Ore. (475), Cal. (296), N. C. (10), N. J. (212); Asia (350); Iceland (226); Eur. (350.1).

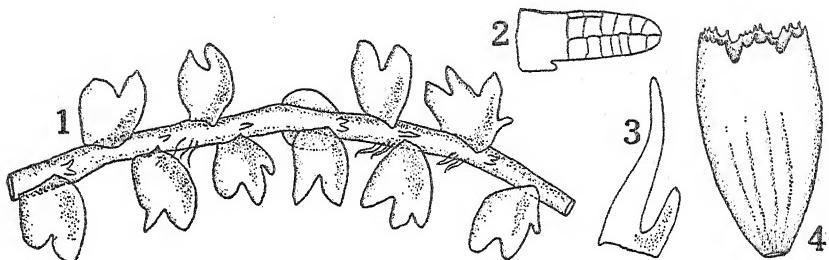
The plant varies exceedingly with the habitat, which accounts for a lot of varieties. It is also peculiar in its vegetative reproduction. The perianths containing only unfertilized eggs are readily deciduous and give rise to basal flagella when only unfertilized eggs are readily deciduous and give rise to basal flagella when broken off. The parts broken off merely continue the formation of subfloral innovations.

1a. *Gymnocolea inflata* var. *heterostipa*²⁴ (Lindb. & Arn.) K. Muell., Rabenh. Krypt.-Fl. 6(1):743, 1910.

Cephalosia heterostipa Carr. & Spruce; Spruce, On Cephalozia 55, 1882.
Jungermannia inflata var. *heterostipa* Lindb. & Arn., Kgl. Sv. Vet.-Akad. Handl. 23(5):47, 1889.

Stems simple or branched; latero-ventral branches commonly present, intercalary, distant, with small leaves, from the axils of unlobed ovate-lanceolate leaves; the stems sometimes forked at tip. Rhizoids often

²⁴ hēt ēr ös' ti pä.



Gymnocoela inflata var. *heterostipa*. 1, Part of plant, ventral view, x 17. 2-3, Underleaves, x 120. 4, Perianth, x 11.3. (All after Pearson.)

numerous to the tip of the stem. Lobes of the leaves more frequently unequal than in the type, when unequal the ventral the larger. Underleaves often present. Name from Gk. *heteros*, different, and *stipos*, stem; apparently referring to the abundant branches on the stem.—In *Sphagnum* bogs and swamps.

ILLUSTRATIONS: Pearson (433) 2: pl. 64.

EXAMINATIONS: Wash. Hamilton (Foster) 1904.

TYPE LOCALITY: Glyders, North Wales (E. M. Holmes) 1876.

RANGE: Greenland (320); Wash. (263); Eur. (329).

The Washington material was collected near Hamilton by A. S. Foster and determined by Dr. A. W. Evans. One would expect it in peat bogs from there to Alaska.

ISOPACHES²⁵ Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):287, 1933.

Lophozia Dum. Rec. d'Obs. 17, 1835, in part.

Sphenolobus Steph., Bull. Herb. Boissier, Ser. 2, 2:164, 1902; and Sp. Hep. 2:156, 1902; in part.

Plants prostrate or the branches ascending to erect, leafy shoots quite narrow. Stems mostly branched, often flagelliferous, the tip curved toward the dorsal side, in cross section about 8 cells thick dorsiventrally, all their walls thin except the thicker cuticular one; epidermal cells of the dorsal surface irregular, 1-2½ times as long as wide, about the width of the interior cells of the leaf base; cortex of ventral side of stem 2 cells thick, the cells little longer than wide; interior cells thin walled, more than 3 times as long as wide. Rhizoids numerous, scattered, colorless or brownish. Leaves succubous with the line of insertion almost a straight line, simply 2-lobed, or where grading into female bracts sometimes 3-lobed, widest about the middle, distinctly concave; lobes acute, somewhat connivent; sinus descending ¼-½ the leaf length. Cells of the

²⁵ i sōp' à kēs.

leaves almost isodiametric; walls normally rather thick and without trigones, in very humid situations the walls thin; trigones hardly visible to large. Gemmae formed on the larger apical divisions of the upper leaves, not restricted to a few cells at the tips of these lobes. Underleaves wanting or here and there represented by a crest 2 cells wide, present in the female inflorescence. Male bracts hemispherically concave. Female bracts 2-3-lobed, also often toothed at margin. Perianth ovoid to oblong-ovoid or oblong-obovoid, emergent for most of its length, contracted to the mouth, 3-5-angled with one angle dorsal, 2 lateral, and with or without 2 dorso-lateral ones; mouth lobed. Seta in cross section with a central group of 4 cells surrounded by a circle of 8 cells, and sometimes by a second circle of 16 cells. Perhaps the name from Gk. *isos*, the same, and *pachys*, thick; in reference to the uniformly thinly walled cells of the stem.

The third species of this genus is *I. decolorans* (Limpr.) Steph., which is known from northern Europe but not from America. Its occurrence in northern North America would not be surprising, thus its characteristics may be of importance to us. Its leaves are so closely imbricate that the leafy branches appear vermicular, while ours have leaves distant to loosely imbricate; in the key below it differs from *I. bicrenatus* in that the leaves are almost transverse and its gemmae 1-2-celled. It is, however, distinctly nearer *I. bicrenatus* than *I. hellerianus*.

- Plants unisexual; leaves slightly succubous but almost transversely inserted; sinus descending $\frac{1}{2}$ - $\frac{1}{2}$ the leaf length; stems filiform; gemmae 1-celled, vinous red..... 1. *hellerianus*.
 Plants bisexual, the male inflorescence below the female one; leaves quite distinctly succubous; sinus descending $\frac{1}{4}$ - $\frac{1}{2}$ the leaf length; stems thick, fleshy; gemmae 2-celled, reddish yellow..... 2. *bicrenatus*.

1. *Isopaches hellerianus*²⁶ (Nees) Buch, Mem. Soc. Fauna Fl. Fennica 8 (1932) :288, 1933.

Jungermannia helleriana Nees in Lindenb., Nova Acta Acad. Caes. Leop.-Carol. Nat. Cur. 14, Suppl.: 64, 1829.

Diplophyllum hellerianum Dum. Rec. d'Obs. 16, 1835.

Jungermannia verruculosa Lindb., Not. Fauna Fl. Fennica 13:369, 1874.

Diplophyllaea helleriana Trev., Mem. Istit. Lomb. Ser. 3, 4:420, 1877.

Jungermannia verruculosa var. *helleri* Lindb. Musci Scand. 8, 1879.

Cephalozia helleri Lindb., Medd. Soc. Fauna Fl. Fennica 14:65, 1887.

Prionolobus hellerianus Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3)1:98, 1894.

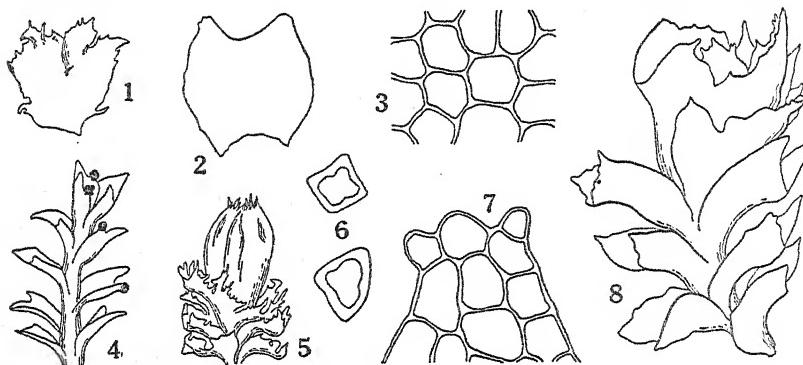
Sphenolobus hellerianus Steph., Bull. Herb. Boissier, Ser. 2, 2:166, 1902; also Sp. Hep. 2:158, 1902.

Lophozia helleriana Boulay Musc. France 2:94, 1904.

Plants in depressed patches, yellowish green to brownish, leafy shoots about 500 μ wide. Stems 2-6 mm long, prostrate or ascending, simple or with few branches, innovating below the female inflorescence, flexuous or arcuate, filiform. Rhizoids numerous except on gemmiparous

²⁶ hĕl' lĕr ī ā' nūs.

shoots, long, colorless. Leaves transversely inserted, not decurrent, distant to loosely imbricate, spreading, simply 2-lobed, subquadrate, concave, half-embracing the stem; margin entire except for the terminal lobes or with a tooth on the ventral side, the dorsal one somewhat secund; lobes triangular, acute to acuminate or cuspidate; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, right-angular to rounded. Cells of the leaf middle 16-25 μ , of the margin little smaller; walls strongly thickened; trigones small to



Isopaches hellerianus. 1, Female bract, $\times 27$. 2, Leaf, flattened out, $\times 27$. 3, Cells of the leaf middle, $\times 143$. 4, Tip of plant showing gemmae, $\times 7$. 5, Tip of plant, with perianth, $\times 21$. 6, Two gemmae, $\times 334$. 7, Tip of leaf, somewhat irregular from formation of gemmae, $\times 142$. 8, Tip of female branch, young, $\times 32$. (1, 5, after K. Mueller; others original, by Elizabeth Curtis.)

hardly present; cuticle verruculose. Gemmiparous branches narrow, with small erect-appressed leaves of modified form, with rhizoids only from base; gemmae from the tips of the upper leaves of these branches, rarely also from the tips of normal branches, irregularly angled to cubic or stellate, 1-celled, wine-red. Underleaves wanting or rarely present, small, scattered, subulate. Plants unisexual; both inflorescences terminal. Male bracts 4-6, erect-spreading, long apiculate, strongly ventricose; antheridium 1. Female bracts larger than the leaves, simply 2-3-lobed at tip, erect, irregularly spinose-dentate, loosely surrounding the base of the perianth; bracteole united with one or both bracts, variable, dentate or spinose-dentate. Perianth about $\frac{1}{2}$ -emergent, not united with the bracts, oblong-obovoid, usually indistinctly 5-plicate above, acutely contracted to about half its width at the mouth; mouth decolorate, lobed; the lobes unequally spinous-ciliate; the cilia 2-8 cells long. Seta about 5 mm long. Sporangium broadly ovoid, about 300 μ long, reddish brown. Elaters about 7 μ thick; spirals 2, loosely wound, reddish brown. Spores 9-12 μ , verruculose, reddish-brown. Named in honor of a friend of Nees, Dr. Heller, who first found it.—On rotting wood in shade.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 290; Meylan (386) fig. 91; Pearson (433) 2: pl. 152; Ekart (124) pl. 12, fig. 103; Macvicar (374) 212, figs. 1-7; Buch, Mem. Soc. Fauna Fl. Fennica 8:285, fig. I, 11, 1832; Ammons (31) 142, fig. B; Douin, Bull. Soc. Bot. France 60: pl. 12, figs. 53-55, 1913.

EXAMINATIONS: B. C. Pass Creek Falls (Macoun 277) 1890; Quesville (Macoun 2867) 1875; Shuswap Lake (Macoun 640) 1903; Vancouver Island (Macoun 210) 1875.—Ont. Belleville (Macoun 182) 1882; Lake Superior (Macoun 217) 1869; Quetico Provincial Park (Drexler 2146) 1939.—Wash. Republic (Foster 2336) 1913.

TYPE LOCALITY: "Im Spessart bei Amorbach," Bavaria, Germany (Dr. Heller).

RANGE: N. S. (53.2), Me. (369.1), N. H. (141), Vt. (244), Mass. (180), R. I. (203), Conn. (164), W. Va. (368), N. Y. (506), Que. (178), Ont. (373), Mich. (485.1), Wis. (98), Minn. (94.1), B. C. (431), Wash. (83); Asia (19.05); Eur. (409).

2. *Isopaches bicrenatus*²⁷ (Schmid.) Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):288, 1933.

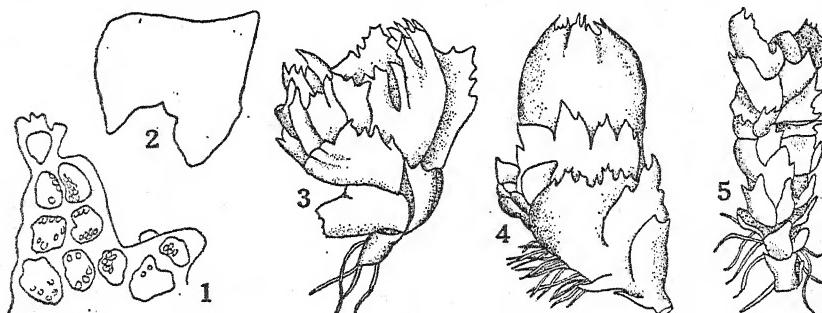
Jungermannia bicrenata Schmid. Icon. Pl., Ed. 2, 3:250, 1797.

Jungermannia commutata Hueben. Hep. Germ. 192, 1834.

Lophosia bicrenata Dum. Rec. d'Obs. 17, 1835.

Jungermannia excisa of Underw. in A. Gray's Manual, Ed. 6, 720, 1889; not of Dicks. Pl. Crypt. Brit. Fasc. 3:11, 1793.

Plants in small thin patches to almost gregarious, reddish brown to reddish yellow or yellowish green, with a distinctive odor; leafy shoots 0.5-1 mm wide. Stems 5-10 mm long, prostrate with ascending tips, very thick and fleshy, usually unbranched, sometimes innovating below the female inflorescence. Rhizoids numerous, present to near the tip of the stem, colorless to brownish. Leaves succubous, not decurrent, mostly closely imbricate, spreading at about 45 degrees, dorsally secund, not horizontal, about half embracing the stem, simply 2-3-lobed, rounded ovate to rounded quadrate, convex on the back, margin entire except for terminal lobes or rarely with a few teeth on or near the lobes; lobes usually 2, or on the upper leaves 3, triangular, acute to right-angular at tip;



Isopaches bicrenatus. 1, Cells of leaf tip, x 770. 2, Leaf, x 150. 3, Tip of female shoot, x 46. 4, Tip of female shoot, with perianth, x 46. 5, Sterile shoot, x 46. (All after Haynes.)

²⁷ bi krē nā' tūs.

sinus descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, roundish or right-angular. Cells of the leaf middle 20-30 μ , of the margin about 20 μ , of the base about 28-30 μ , rounded polygonal, guttulate; walls thick; trigones large; cuticle granulate. Gemmae in clusters on the tips of the lobes of the upper leaves, irregularly to stellately obtusely lobed, 20-25 μ , 2-celled, rather thickly walled, reddish yellow. Underleaves wanting except among the female bracts. Plants bisexual. Male inflorescence below the female one, on the same branch or on a lateral branch; male bracts imbricate, unequally 2-lobed with the ventral lobe the larger, the margins sometimes toothed; antheridia 1-2. Female inflorescence terminal; female bracts rather larger than the leaves, transversely inserted, 2-lobed with a tooth on the dorsal margin, or the tooth so large that the bract is 3-lobed; the lobes entire to dentate; bracteole broadly subulate to 2-lobed for $\frac{1}{2}$ the length, the lobes acuminate; one margin often somewhat united with a bract. Perianth about $\frac{3}{4}$ -emergent, ovoid to oblong-ovoid, the upper half deeply plicate; mouth constricted, hyaline, irregularly spinose-ciliate and dentate, the cilia 2-4 cells long. Sporangium ovoid, reddish brown, its walls 3 cells thick; epidermal layer with nodular thickenings; innermost layer of wall with semiannular thickenings. Elaters about 8 μ thick; spirals 2, reddish brown. Spores 10-15 μ , granulate, reddish brown. Name the *L. bicrenatus*, twice or doubly notched; probably referring to the mouth of the perianth.—On sandy soil; on banks and turf walls; subalpine.

ILLUSTRATIONS: Pearson (433) 2: pl. 139; K. Mueller (409) 1: fig. 315; Haynes, Bryologist 9: pl. 9, figs. 5-9, 1906; Macvicar (374) 188, figs. 1-5; Buch, Mem. Soc. Fauna Fl. Fennica 8:285, fig. I, 8-10, 12, 1932; Meylan (386) fig. 108; Warnstorff (523) 192, fig. 1; Gil (76) fig. 238; Griggs, Amer. Jour. Bot. 20:103, fig. 4, two at right, 1933; Ammons (31) 141, fig. A; Jensen (323.5) 125, 3 figs.

EXAMINATIONS: Conn. West Goshen (Underwood) 1889.

TYPE LOCALITY: European.

RANGE: Greenland (428.1), N. S. (53), Me. (155), N. H. (359), Vt. (140), Mass. (235), R. I. (169), Conn. (139), N. Y. (4), Que. (178), One. (431), Pa. (212), Mich. (213), Wis. (98), Minn. (94.1), Alaska (239.1), B. C. (51)(?), Ky. (218), W. Va. (3.2), Tenn. (464), N. C. (12), N. J. (212); Asia (350); Eur. (491); Spitzbergen (524.3).

*SPHENOLOBUS*²⁸ (Lindb.) Steph., Bull. Herb. Boissier, Ser. 2, 2:164, 1902; and Sp. Hep. 2:156, 1902.

Jungermannia subgenus *Sphenolobus* Lindb., Not. Fauna Fl. Fennica 13:369, 1874, in part.

Jungermannia section *Saxicolae* Jensen Danmarks Mossser, Bryofyter 1:104, 1915, in part.

Plants green to brownish or rarely blackish; leafy shoots 1-3 mm wide. Stems prostrate to suberect, 2-3.5 cm long, simple to somewhat branched, composed wholly of cells with thin walls except the cuticle,

²⁸ sfēn ól' ó būs.

differentiated into a cortical region and an interior one; cortex 3 cells thick, its cells nearly all 1-2 times as long as wide and rectangular; interior cells not wider than the cortical cells but much longer. Rhizoids wanting to comparatively few. Leaves with the dorsal half transversely inserted, the ventral half distinctly succubous, not decurrent, contiguous to closely imbricate, spreading to erect and tightly applied to each other, simply 2-lobed, from slightly longer than wide to much wider than long, widest above their middle, hemispherically to semicylindrically concave through inrolling of margins; margin entire; lobes mostly unequal with the ventral one the larger, sinus descending $\frac{1}{4}$ - $\frac{1}{2}$ the leaf length. Cells of the leaf middle 15-25 μ , the cell cavity roundish to angular; walls somewhat thickened; trigones wanting to rather large but not bulging; cuticle verruculose. Underleaves wanting or present only as the bracteole. Plants unisexual, both inflorescences usually terminal. Male bracts saccate at base; antheridia 1-3, ovoid-globose. Female bracts larger than the leaves, irregularly 2-4-lobed, erect, the lobes acute to bristle-pointed. Perianth free from the bracts, about $\frac{3}{4}$ -emergent, cylindrical to oblong, plicate in the apical portion, rather suddenly contracted to the mouth; mouth not tubular, dentate to ciliate. Sporangium exserted, with walls 2-3 cells thick; all the wall layers with semiannular thickenings on the cell walls. Elaters with 2 brown spirals. Spores 12-15 μ , verruculose or papillose, brown. Name from Gk. *sphen*, a wedge, and *lobos*, a flap; in reference to the V-shaped leaf as viewed from its apex.

Leafy branches 1-1.5 mm wide; cell-hollow clearly angular; female bracts entire except for the 2-4 terminal lobes.

Leaves loosely imbricate if at all, as long or longer than wide when spread out; the lobes triangular, not curved toward the stem; sinus descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length.....

1. *S. minutus*.

Leaves closely imbricate, decidedly wider than long when spread out; the lobes ovate, the dorsal lobe curved toward the stem; sinus descending $\frac{1}{6}$ - $\frac{1}{2}$ the leaf length.....

1a. var. *grandis*.

Leafy branches about 3 mm wide; leaves decidedly wider than long when spread out; cell-hollow circular to oval because of the larger trigones; female bracts serrate-dentate to spinose-dentate in addition to the 2-4 apical lobes.....

2. *S. saxiculus*.

1. *Sphenolobus minutus*²⁹ (Crantz) Steph., Bull. Herb. Boissier, Ser. 2, 2:165, 1902; also Sp. Hep. 2:157, 1902.

Jungermannia minuta Crantz, in Dicks. Pl. Crypt. Brit. Fasc. 2:13, 1790.

Jungermannia bicornis Weber & Mohr Bot. Taschenb. 423, 1807.

Jungermannia weberi Mart. Fl. Crypt. Erlangensis 157, 1817.

Jungermannia gypsophylla Wallr. Fl. Crypt. Germ. 1:63, 1831.

Jungermannia trevirana Hueben. Hep. Germ. 240, 1834.

Diplophyllum minutum Dum. Rec. d'Obs. 16, 1835.

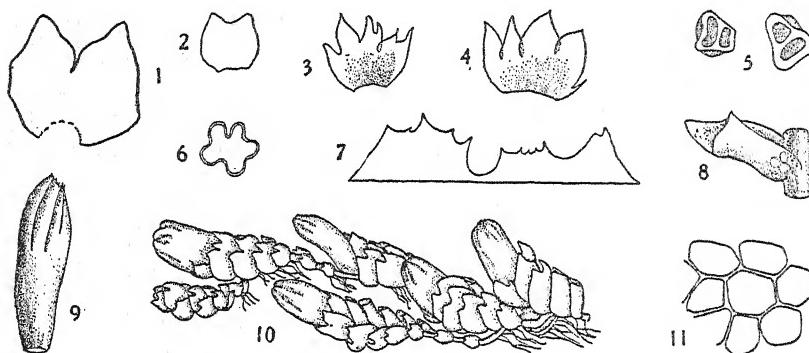
Jungermannia rigida Lindb. Musci Scand. 8, 1879.

Jungermannia subdichotoma Lindb., Mittheil. Soc. Fauna Fl. Fennica, Feb. 3, 1883.

²⁹ mi nüt' ūs.

Lophosia minuta Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3):85, 1893.
Diplophyllum gypsophyllum Loeske, Verh. Bot. Ver. Brandenburg 46:167, 1904.

Plants in patches or mats, green or brownish; leafy shoots 1-1.5 mm wide. Stem 2-3 cm long, filiform, fragile, prostrate to suberect, little branched, innovating below the perianth. Rhizoids few on the sterile plants, more numerous on female plants; almost none on upper part of stem. Leaves transversely inserted, not decurrent, contiguous to imbricate, quite regularly distributed, erect-spreading to spreading, somewhat dorsally secund, simply 2-lobed, broadly quadrate, semicylindrically concave, about half-clasping the stem; margin entire, sometimes apparently toothed due to the formation of gemmae; lobes widely triangular, acute or bluntly acute, mostly equal but sometimes the ventral the larger; sinus descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, acute to obtuse or rounded. Cells of the leaf middle 20-25 μ in longest diameter, of the margin 15-20 μ and not



Sphenolobus minutus. 1, Leaf, x 12. 2, Leaf, x 6.4. 3-4, Female bracts, x 13.1. 5, Two gemmae, x 265. 6, Cross section of perianth, x 13.1. 7, Mouth of perianth, x 104. 8, Male bract with three antheridia, x about 26. 9, Perianth, x 10.2. 10, Plant with abundant perianths, x 6.4. 11, Cells of the leaf middle, x 370. (1, 11, original by Elsie K. Waddingham; 2, 10, after K. Mueller; 3-4, 6-9, after Pearson; 5, after Gil.)

different from the second row; walls thick; trigones none or small; cuticle minutely verruculose. Gemmae on the margin and tip of the upper leaves, irregularly angular to tetrahedral, 2-celled, 15-30 μ in longest diameter. Underleaves wanting except among the bracts. Plants unisexual; both inflorescences terminal. Male bracts 8-24, similar to the leaves, somewhat saccate-concave at base; antheridia 1-2, oval-globose. Female bracts larger than the leaves, irregularly 2-4-lobed, erect, not united with each other; margin entire; lobes apiculate to acuminate; bracteole broadly lanceolate, often somewhat united with one of the bracts. Perianth free from the bracts, about $\frac{3}{4}$ -emergent, cylindric, about 2 mm long and 1 mm wide, suddenly contracted to the mouth, deeply plicate in the upper third;

mouth 4-5-lobed; the lobes with teeth 2-3 cells long. Seta about 5 mm long. Sporangium ovoid, brown, its wall 2 cells thick; both the epidermis and the inner wall layer with semiannular thickenings. Elaters 8 μ thick; spirals 2, brown. Spores 12-15 μ , papillose, brown. The species name from the narrow, rather filiform leafy plants.—On peaty banks among rocks, or on wet rocks, in woods; subalpine to alpine.

ILLUSTRATIONS: Hooker (285) pl. 44; Pearson (433) 2: pl. 153; K. Mueller (409) 1: fig. 291; Buch, Mem. Soc. Fauna Fl. Fennica 8 (1932) :285, figs. 18-23, 1933; Ekart (124) pl. 1, fig. 3; Warnstorff (523) 165, fig. 4; Macvicar (374) 209, figs. 1-5; Meylan (386) fig. 89; Gil (76) fig. 224; Ammons (3.1) 142, fig. D; Jensen (323.5) 109, 2 figs.

EXAMINATIONS: Alaska, Verdure Creek (Frye) 1913.—*Alta.* Altrude Lakes in Banff National Park (Rakestråw) 1937.—*B. C.* Stephens (Brinkman 785) 1913.—*Ida.* Kootenai County (Leiberg 30) 1890.—*N. W. Territories of Canada.* Clyde (N. B. Granson) Sept. 5, 1938.

TYPE LOCALITY: Greenland.

RANGE: Greenland (501), Devon Isl. (485.6), Baffin Isl. (485.6), Melville Penin. (485.6), District of Keewatin (485.6), Nottingham Island in Hudson Strait (373), Labrador (510), N. S. (53.2), Me. (369.1), N. H. (169), Vt. (203), Mass. (180), N. Y. (258), Que. (178), Ont. (373), Mich. (419), Wis. (94), Alta. (46.2), Yukon (298), Alaska (135), B. C. (247.1), Ida., Wash. (81), N. C. (43), Va. (271), W. Va. (468); Mex. (224); Asia (248.1); Spitzbergen (248.1); Jan Mayen (248.1); Iceland (248.1); Eur. (361.1); Azores (56.58); Africa (433); Kerguelen Isl. (226).

Hardy (246.1) reports the variety *cuspidata* Kaal. (329) from British Columbia. K. Mueller (409) considers it a shade form. We favor the latter point of view.

1a. *Sphenolobus minutus* var. *grandis*³⁰ (Lindb.) Lindb. & Arn., Kgl. Sv. Vet.-Akad. Handl. 23(5):60, 1889.

Cephalozia rigida var. *grandis* Lindb., Bot. Not. 165, 1872.

Jungermannia rigida var. *grandis* Lindb., Musci Scand. 8, 1879.

Jungermannia saccatula Lindb., Mittheil. Soc. Fauna Fl. Fennica, Feb. 3, 1883.

S. saccatus K. Muell., Rabenh. Krypt.-Fl. 6(1):599, 1910.

Plants more vigorous than the type, brownish green to blackish brown, catkin-like. Leaves densely imbricate, erect or nearly so, very strongly convex and thus apparently hemispheric or inflated, much wider than long when flattened out; lobes broadly ovate, blunt, the upper lobe with the tip bent toward the stem; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length. Cells of the leaf middle about 25 μ , of the lobes about 15 μ ; walls somewhat thickened; trigones distinct especially from the middle to the base of the leaf. Name the *L. grandis*, large; because it is more vigorous than the type.—On peaty or rather sandy peaty soil.

ILLUSTRATIONS: None.

EXAMINATIONS: None.

TYPE LOCALITY: Muonio, in what used to be Lapland (Norrlin) 1867.

RANGE: N. Amer. (325); Asia (350); Eur. (409); Spitzbergen (325).

³⁰ grān' dis.

We are following Joergensen (325) in this, since, among recent writers, he was probably best acquainted with this plant. We do not know the basis of Joergensen's report of this variety from North America.

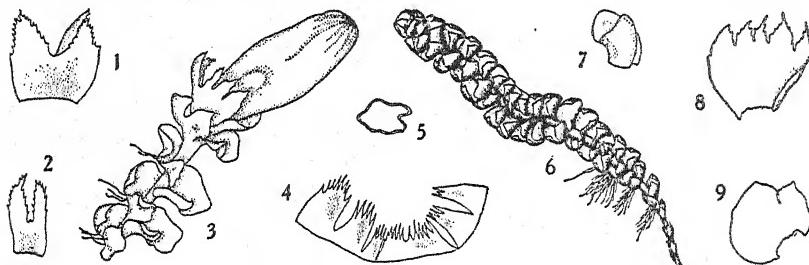
2. *Sphenolobus saxicola*³¹ (Schrad.) Steph., Bull. Herb. Boissier, Ser. 2, 2:168, 1902; also Sp. Hep. 2:160, 1902.

Jungermannia saxicola Schrad. Samml. Krypt. Gewächse, No. 97, 1796.

Diplophyllum saxicolum Dum. Rec. d'Obs. 16, 1835.

Lophozia saxicola Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3):85, 1893.

Plants scattered among mosses or in compact flattish patches, yellowish brown to somewhat brownish olive; leafy shoots about 3 mm wide. Stems 2-3.5 cm long, ascending to suberect, filiform, rigid, brittle, flexuous or arcuate, more or less branched, innovating below the female inflorescence. Rhizoids few, almost wanting above, colorless. Leaves transversely inserted, not decurrent, contiguous to imbricate, erect-spreading, simply 2-lobed, roundedly or quadrately ovate, concave to semicylindric;



Sphenolobus saxicola. 1, Female bract, x 10.2. 2, Female bracteole, x 10.2. 3, Tip of shoot with perianth, x 8.5. 4, Mouth of perianth, x 13.6. 5, Cross section of perianth, x 6.8. 6, Sterile shoot, x 5.9. 7, Leaf, x 10.2. 8, Female bract, x 8.5. 9, Leaf, x 8.5. (1-2, 4-5, 7, after Pearson; 3, 6, 8-9, after K. Mueller.)

margin entire, the dorsal one somewhat secund; lobes unequal with the larger ventral, ovate; dorsal lobe acute to subacute, slightly incurved at tip; ventral lobe oblique, obtuse, incurved; sinus descending about $\frac{1}{2}$ the leaf length, recurved, acute, gibbose. Cells of the leaf middle 15-24 μ , of the margin slightly smaller, roundish-quadrangular; walls somewhat thickened; trigones large; cuticle striate-verruculose. Gemmae wanting. Under-leaves wanting. Plants unisexual; both inflorescences terminal. Male plant more slender; male bracts a few pairs, saccate at base; antheridia 1-3, ovoid-globose. Female bracts slightly larger than the leaves, erect, concave, closely surrounding the base of the perianth, irregularly 2-4-lobed; their lobes acute or bristle-pointed, their margins serrate-dentate to spinose-dentate; their sinuses descending $\frac{1}{4}$ - $\frac{1}{3}$ the bract length. Perianth free from the bracts, about $\frac{3}{4}$ -emergent, oblong-cylindric, 3-4 mm long,

³¹ sāk' ik' ó lūs.

about 1.5 mm wide, obtusely plicate near the tip, roundish contracted to the mouth; mouth irregularly ciliate-dentate, the cilia up to 6 cells long. Seta about 5 mm long. Sporangium ovoid, with wall 3 cells thick, all three layers with semiannular thickenings; epidermal cells larger than the others. Elaters about 8μ thick; spirals 2, loosely wound, dark brown. Spores about 12μ , minutely verruculose, dark brown. Name from *L. saxum*, rock, and *colere*, to inhabit; in reference to its common occurrence on rocks.—On rocks, or on soil in bogs; subalpine.

ILLUSTRATIONS: Pearson (433) 2: pl. 154; K. Mueller (409) 1: fig. 293; Macvicar (374) 208, figs. 1-3; Ekart (124) pl. 9, fig. 73.

EXAMINATIONS: None.

TYPE LOCALITY: Meissner in Hesse, Germany (Schrader).

RANGE: Greenland (373), Baffin Land (491), Que. (178), Yukon (298), Alaska (135), B. C.³² (46.1); Asia (350); Eur. (329).

Hooker's *Jungermannia resupinata* (285) pl. 23 is *Scapania compacta*, according to G. L. & N. (226), page 63.

LEIOCOLEA³³ Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):288, 1933.

Lophozia subgenus *Leiocolea* K. Muell., Rabenh. Krypt.-Fl. 6(1):711, 1911.

Jungermannia section *Jungermanniae muelleri* Jens. Danmarks Mosser, Bryofyter 1:128, 1915.

Jungermannia subgenus *Leiocolea* Arn., Arkiv f. Botanik 19(10):75, 1925.

Stems 0.3-8 cm long, with few or no branches, rejuvenating from beneath the inflorescence; cortex 1-2 cells thick, the ventral ones shorter than the interior ones and shorter than cells of leaves; ventral epidermal cells in 4 or more rows; in cross section of stem the cortical cells smaller than the interior ones and smaller than the cells of the leaves. Rhizoids numerous, colorless to brownish or reddish purple. Leaves quite strongly succubous, not to little decurrent dorsally, distant to imbricate, horizontally spreading to erect or dorsally secund, simply 2-lobed, the lobes equal or the ventral the larger; margin usually entire except for the terminal lobes or with a few teeth; lobes acute to rounded, sometimes apiculate, entire; sinus descending $\frac{1}{6}$ - $\frac{1}{3}$ the leaf length, acute to crescentic, in some species gibbose. Cells of the leaf middle 15-50 μ ; walls thin or in one species thick and yellow; trigones wanting to bulging; cuticle smooth to verruculose or striate-verruculose. Gemmae mostly unknown, but in some species common. Underleaves wanting or usually scarce to abundant, awl-shaped or lanceolate to ovate, unlobed or commonly 2-lobed, the margin entire or usually toothed to ciliate. Plants bisexual or unisexual. Male inflorescence terminal or just below the female one, rarely farther down the stem; antheridia 1-3. Female inflorescence terminal on an ordinary

³² We examined Brinkman's Nos. 784 and 785 and found no *S. saxicola* in them.

³³ $11 \text{ } \overset{\circ}{\text{C}} \text{ } 16 \text{ } \overset{\circ}{\text{C}}$.

stem or branch; the bracts free from each other and from the bracteole, oblong or ovate to quadrate or roundish, 2-4-lobed, entire to toothed or ciliate; bracteole rarely wanting, with 2-3 lobes or teeth. Perianth free from the bracts, $\frac{2}{3}$ - $\frac{5}{6}$ -emergent, plicate toward tip or more rarely smooth, oblong-ovoid or cylindric to clavate or pyriform, mostly suddenly contracted to mouth; mouth from distinctly tubular to not at all so, crenate or dentate to lobed or ciliate, not entire. Sporangium exserted, ovoid; epidermal cells larger than the other wall cells, with nodular or rarely semiannular thickenings; inner wall layer with semiannular thickenings. Elaters with 2 reddish brown spirals. Spores 10-20 μ , reddish brown or brown. The name from Gk. *leios*, smooth, and *koleos*, sheath; in reference to the perianth, which is sometimes smooth.

- A. Gemmae unknown or rare and thus the upper leaves not or rarely erose at tip.
- B. Underleaves wanting or scarce.
 - C. Cells of the leaf middle 35-45 μ ; leaf sinus not gibbose; lobes of the sterile leaves mostly acute, rarely some obtuse.....
 - CC. Cells of the leaf middle 30-35 μ ; leaf sinus gibbose; lobes of the sterile leaves mostly obtuse or rounded, rarely some apiculate.....
- BB. Underleaves abundant.
 - D. Walls of the leaf cells thin and colorless; leaf cells 27-50 μ .
 - E. Underleaves small to medium in size.
 - F. Trigones mediumly large to bulging; plants unisexual.
 - G. Cells of the leaf middle 35-50 μ ; leaf lobes acute to obtuse; margin of underleaves with a tooth at one or both sides.....
 - GG. Cells of the leaf middle 27-33 μ ; leaf lobes mostly apiculate; margin of underleaves more or less lobed.....
 - FF. Trigones small; plants bisexual.....
 - EE. Underleaves large, some of them more than half as long as the leaves; trigones moderately large to bulging.....
 - DD. Walls of the leaf cells thick and yellowish; leaf cells 15-24 μ
 - AA. Gemmae common and thus the upper leaves commonly erose at tip.....

1. *Leiocolea badensis*³⁴ (Gottsche & Rabenh.) Joerg., Bergens Mus. Skrift. 16:166, 1934.

Jungermannia turbinata of many later authors. Not of Raddi, Mem. Soc. Ital. Sci. Modena 18:18, 1818.

Jungermannia badensis Gottsche, Gottsche & Rabenh. Hep. Eur. Exsic. No. 95, 1859.

Lophozia badensis Schiffn., Lotos 51: p. 7 of reprint, 1903.

Lophozia gypsacea Schiffn., Verh. Zool.-Bot. Gesell. Wien 54:399, 1904. Not of Schleich. Cat. 1821.

Lophozia (subgenus *Leiocolea*) *badensis* K. Muell., Rabenh. Krypt.-Fl. 6(1):730, 1910.

1. *L. badensis*.

2. *L. obtusa*.

3. *L. bantriensis*.

4. *L. muelleri*.

7. *L. gillmani*.

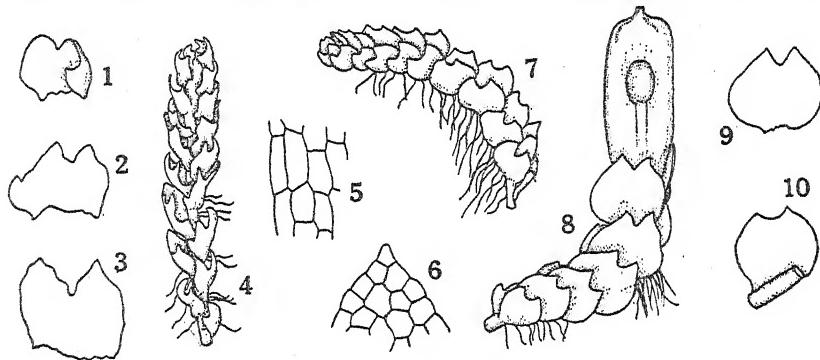
8. *L. rutheana*.

5. *L. harpanthoides*.

6. *L. heterocolpa*.

³⁴ bäd' ēn' sis.

Plants in patches, small, yellowish green; leafy shoots 0.6-1 mm wide. Stems 3-12 mm long, prostrate to ascending, simple or little branched, often with innovations from beneath the female inflorescence, translucent, flattened dorsally, often brownish on the ventral side; epidermal layer of long cells, smaller in cross section than the interior ones. Rhizoids numerous, present to near tip of stem, colorless or brownish, long. Leaves distinctly succubous, somewhat dorsally decurrent, distant to subimbricate, horizontal to spreading or erect-spreading, simply 2-lobed, quadrate-ovate to roundish ovate, or rectangular on the smaller sterile stems, wide at base, slightly to distinctly convex dorsally; margins entire except for the terminal lobes, the two alike or the ventral one the more curved; lobes equal, or slightly unequal and the ventral one the larger, connivent, acute



Leiocolea badensis. 1-3, Female bracts, x 16. 4, Male inflorescence, x 13.8. 5, Epidermal cells of the stem, x 92. 6, Tip of a leaf lobe, x 93. 7, Tip of sterile shoot, dorso-lateral view, x 13. 8, Female shoot, x 13. 9-10, Leaves, x 16. (5-6, after Jensen; other after K. Mueller.)

or some lobes more blunt; sinus descending $\frac{1}{5}$ - $\frac{1}{3}$ the length, usually acute. Cells of the leaf middle 35-45 μ , of the margin 30-35 μ , 4-6-angled, translucent; walls thin; trigones small; cuticle smooth or finely striate-verruculose. Underleaves wanting, or rarely one or more present and more or less rudimentary. Plants unisexual. Male plants intermingled with the female ones and like them; male inflorescence not terminal, farther down the stem; male bracts several pairs, suberect, approximate, concave, the dorsal lobe usually with a tooth, or the bract 3-lobed; antheridia 2. Female inflorescence terminal; female bracts erect, concave, roundish ovate to roundish quadrate, bilobed for $\frac{1}{6}$ - $\frac{1}{3}$ the bract length, occasionally with a small third lobe, the lobes acute, the sinus acute; bracteole usually wanting. Perianth $\frac{2}{3}$ - $\frac{3}{4}$ -emergent, clavate-cylindric, slightly plicate toward the tip, often with a deep dorsal groove, rather roundedly contracted to the mouth; mouth shortly beaked, crenulate with long cells.

Seta exerting the sporangium. Sporangium widely ovoid, darkly reddish brown, the valves 400-500 μ wide; epidermal cells with nodular thickenings; cells of the inner layer with semiannular thickenings. Elaters 7-8 μ thick; spirals 2, about 2.5 μ wide, loosely wound, reddish brown. Spores 10-15 μ , verruculose, reddish brown. So named because it was first found in Baden, Germany.—On calcareous rocks, on soil or on sand.

ILLUSTRATIONS: Lorenz, Bryologist 14:30, pl. 5, 1911; K. Mueller (409) 1: fig. 330; Macvicar (374) 168, figs. 1-4; Meylan (386) fig. 124; Jensen (323.5) 139, 4 figs.

EXAMINATIONS: Alta. Altitude Lakes in Banff National Park (Rakestraw) 1937.—Ia. Lacey-Reosauqua State Park in Van Buren County (Conard) 1939.—Mich. Tahquamenon Falls in Luce County (Nichols) 1935.—Mont. Piegan Pass in Glacier National Park (Frye) 1928.—Wash. Orcas Island (Clark) 1923.

TYPE LOCALITY: "Molassenfelsen im Stadtgraben bei Ueberlingen am Bodensee," Baden, Germany (Jack).

RANGE: Ellesmere Isl. (409), N. S. (53.2), N. H. (185), Vt. (245), Conn. (203), N. Y. (159), Que. (159), Ohio (94.3), Mich. (419), Wis. (98), Iowa, Alta. (46.2), Mont. (81), B. C. (46.1), Wash. (81); Asia (350); Eur. (409).

It seems very likely that *Jungermannia wallrothiana* G. L. & N. Syn. Hep. 104, 1844 (not *J. wallrothiana* Hüben. Hep. Germ. 85, 1834, which is probably *Nardia scalaris*) is *Lophozia badensis*. Schiffner, in Verh. Zool. Bot. Gesell. Wien 54:396, 1904, points out that doubt arises in that original material of *J. wallrothiana* of G. L. & N. is wanting for comparison. Even if the plant were a good species the name belongs to Huebener's plant.

2. *Leicolea obtusa*³⁵ (Lindb.) Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):288, 1933.

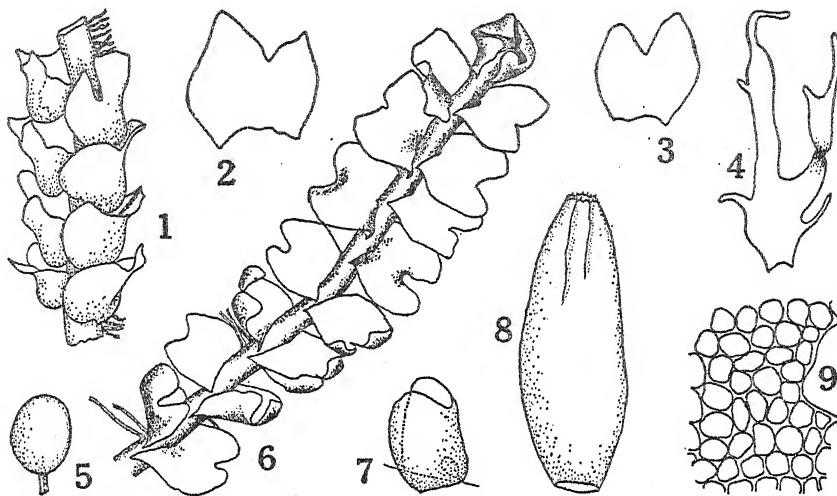
Jungermannia obtusa Lindb. Musci Scand. 7, 1879.

Lophozia obtusa Evans, Proc. Washington Acad. Sci. 2:303, 1900.

Lophozia (subgen. *Barbilophozia*) *obtusa* K. Muell., Rabenh. Krypt.-Fl. 6(1):648, 1910.

Plants scattered among mosses, or in loose patches, green to yellowish green. Stems 2-6 cm long, ascending to erect, thick, flexuous, usually unbranched, under surface reddish purple, with innovations beneath the female bracts. Rhizoids numerous, occurring to the tip, reddish purple at base, short. Leaves strongly succubous, slightly to hardly decurrent dorsally, distant to subimbricate, horizontal to suberect, the upper part reflexed, simply 2-lobed, roundish quadrate, plane or slightly concave, flaccid; margin entire except for the terminal lobes, or sometimes with a small tooth-like lobe on the dorsal margin near its base; lobes equal or the ventral one slightly the larger, broadly ovate, sometimes on the same stem rounded to obtuse or even apiculate at apex; sinus descending to about $\frac{1}{3}$ the leaf length, right-angular to rounded, gibbous. Cells of the leaf middle 30-35 μ , of the margin 25-30 μ , oblong to round; walls thin; trigones none or small; cuticle striate-verruculose. Gemmae rare, at the tips of the leaf lobes, angular, pale green, mostly 1-celled, 18-20 μ . Under-

³⁵ öb tū' sā.



Leiocolea obtusa. 1, Male inflorescence, x 14. 2-3, Leaves, x 18.2. 4, Underleaf, x 56. 5, Antheridium, x 60. 6, Sterile tip of plant, x 14. 7, Male bract, x 17. 8, Perianth, x 11.3. 9, Leaf cells just below the sinus, x 141. (1-4, 6, 9, after K. Mueller; 5, 7-8, after Pearson.)

leaves present where stems fork, elsewhere wanting or rudimentary, deeply 2-lobed, the lobes triangular to subulate, the margin often somewhat ciliate. Plants unisexual. Male plants more delicate; male inflorescence terminal or farther down the stem; male bracts 12-40, smaller than the leaves, concave, saccate at base, 2-lobed; the lobes unequal, obtuse, incurved; antheridia 2-3, globose. Female inflorescence terminal, transversely inserted, erect or the upper portion reflexed, about equaling the leaves or smaller, irregularly 4-lobed; the margin often slightly dentate; lobes acute to more rarely obtuse; sinuses obtuse to subacute; bracteole large, often deeply 2-lobed, variable in form, margins entire. Perianth narrowly to clavately cylindric, emergent for nearly all its length, plicate in the upper $\frac{1}{3}$, contracted to the mouth; mouth dentate, the teeth sometimes slightly serrate. Sporophyte unknown. Name the *L. obtusus*, blunt; in reference to the rounded lobes of the leaves.—In shade; on wood, on soil, on rocks, among mosses; mostly alpine.

ILLUSTRATIONS: Bernet, Cat. Hep. Suisse, pl. 4, 1888; Pearson (433) 2: pl. 136; K. Mueller (409) 1: fig. 305; Meylan (386) fig. 104; Macvicar (374) 205, figs. 1-3.

EXAMINATIONS: Cal. Bear Badger Lake in Madera County (Howell 586) 1941.—Ore. Near head of Lick Creek in Wallowa Mts. (Rakestraw) 1935.—Wash. Friday Harbor (Wentworth) 1923; North side of Orcas Island (Clark) 1925.—Wyo Dubois (Frye) 1931; Yellowstone National Park (Frye) 1934.

TYPE LOCALITY: Near Stockholm, Sweden.

RANGE: Ellesmere Isl. (168), Me. (203), Mich. (485.1), Wyo. (83), Ida. (82), Alaska (135), B. C. (94.2), Wash. (81), Ore. (81), Cal.; Eur. (386).

3. *Leiocolea bantriensis*³⁶ (Hook.) Joerg., Bergens Mus. Skrift. 16:164, 1934.

Jungermannia bantriensis Hook. Brit. Jung., in note to pl. 41, 1816.

Jungermannia bidentata var. Hook. Brit. Jung., Syn. 16 and Suppl. pl. 3, 1816.

Jungermannia hornschuchiana Nees Naturg. Eur. Leberm. 2:153, 1836.

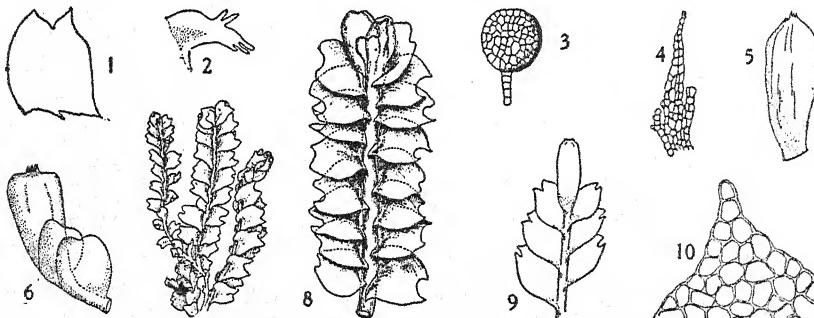
Jungermannia muelleri var. *bantryensis* Kaal., Nyt. Mag. Naturvid. 33:357, 1893.

Lophozia bantryensis Steph., Bull. Herb. Boissier, Ser. 2, 1:1150, 1901; and Sp. Hep. 2:133, 1901.

Lophozia hornschuchiana Macoun Cat. Canadian Pls. 7:18, 1902.

Lophozia (subgenus *Leiocolea*) *hornschuchiana* K. Muell., Rabenh. Krypt.-Fl. 6(1):723, 1910.

Plants in large tufts, dark green to reddish brown, with a fatty lustre; leafy shoots 3-4 mm wide. Stems 2-8 cm long, procumbent to erect, brownish green, flexuous, usually simple to furcate or somewhat pinnately branched, innovating beneath the perianth. Rhizoids fairly abundant, present to near tip of stem, rather long, colorless to brownish. Leaves succubous, decurrent dorsally, approximate to rather loosely imbricate, horizontally widely spreading to dorsally secund, simply 2-lobed, obliquely roundish, somewhat convex on the adaxial side; margin entire except for the apical lobes, the dorsal margin slightly revolute; lobes broadly triangular, acute to obtuse, usually unequal and then the dorsal lobe usually the smaller; sinus descending $\frac{1}{6}$ - $\frac{1}{4}$ the leaf length, right-angular to crescentic, usually gibbous. Cells of the leaf middle 35-50 μ , of the leaf tips 30-35 μ , of the leaf base 40-60 μ , rounded-polygonal, translucent; walls thin; trigones small; oil bodies numerous, small; cuticle striate-



Leiocolea bantriensis. 1, Leaf, x 8.5. 2, Part of mouth of perianth, x 36. 3, Antheridium, x about 40. 4, Underleaf, x 21. 5, Perianth, x 10.2. 6, Tip with perianth, x 6.8. 7, Sterile shoots, x 1.7. 8, Sterile shoot, dorsal view, x 10.2. 9, Tip with perianth, dorsal view, x 5.1. 10, Cells of the leaf tip, x 85. (1, 4, 7, 10, after K. Mueller; 2, 5-6, 8, after Pearson; 3, after Hooker; 9, after Meylan.)

verruculose. Gemmae unknown. Underleaves small to rather large, various in form, lanceolate, sometimes bilobed; the margin somewhat lobed in addition to the apical lobes, the one or 2 tips ending in a long narrow almost ciliate point. Plants unisexual; the male and female plants in separate tufts; both inflorescences terminal. Male inflorescence shortly spicate; male bracts concave, the dorsal margin with a large incurved tooth; antheridia 1-2. Female bracts resembling the leaves, nearly transversely inserted, erect-spreading, narrower, concave, the margins entire except for the terminal lobes; bracteoles larger than the underleaves, otherwise very similar to them. Perianth $\frac{2}{3}$ - $\frac{3}{4}$ -emergent, nearly cylindric, smooth, very slightly 4-plicate near the apex, obtusely or roundedly contracted to mouth; mouth shortly beaked, shortly and unequally ciliate. Seta about 1 cm long. Sporangium ovoid, blackish brown; epidermal cells large, quadrate, with very small nodular thickenings; innermost layer of much elongated cells, with semiannular thickenings. Elaters short, 10-12 μ thick; spirals 2, reddish brown. Spores 12-16 μ , verruculose, reddish brown. The name from the Irish town near which it was first found.—On wet rocks and stream banks; subalpine and alpine.

ILLUSTRATIONS: Pearson (433) 2: pl. 133; Hooker (285) Suppl. pl. 3; K. Mueller (409) 1: fig. 328; Macvicar (374) 171, figs. 1-5; Meylan (386) fig. 121; Gil (76) figs. 241-242.

EXAMINATIONS: Alta. Banff National Park (Rakestraw) 1937.—B. C. Yoho National Park (Rakestraw) 1937.—Wash. Friday Harbor (Daugherty) 1923; Seattle (Roberts) 1925.

TYPE LOCALITY: In Laharn wood near Bantry, Ireland (Miss Hutchins). About Lat. $51^{\circ} 40' N.$, Long. $9^{\circ} 32' W.$

RANGE: Greenland (322), Alta. (373), B. C. (95), Wash. (81), Ore. (81), Cal. (202); Asia (19.05); Eur. (422.2).

Howe (296) 109-110, comments on his examination of what was labeled original material of the plant Hooker had before him when he named *L. bantriensis*. He concludes that it is *L. hornschuchiana*.

4. *Leiocolea muelleri*³⁷ (Lindenb.) Joerg., Bergens Mus. Skrift. 16:163, 1934.

Jungermannia muelleri Nees, in Lindenb., Nova Acta Acad. Caes. Leop.-Carol. Nat. Cur. 14, Suppl.:39, 1829.

Jungermannia acuta Lindenb., Nova Acta Acad. Caes. Leop.-Carol. Nat. Cur. 14, Suppl.:88, 1829.

Lophoszia muelleri Dum. Rec. d'Obs. 17, 1835.

Lophoszia acuta Dum. Rec. d'Obs. 17, 1835.

Jungermannia collaris Nees Naturg. Eur. Leberm. 2:156, 1836.

Jungermannia bantriensis var. *muelleri* Lindb., Acta Soc. Sci. Fennica 10:528, 1875.

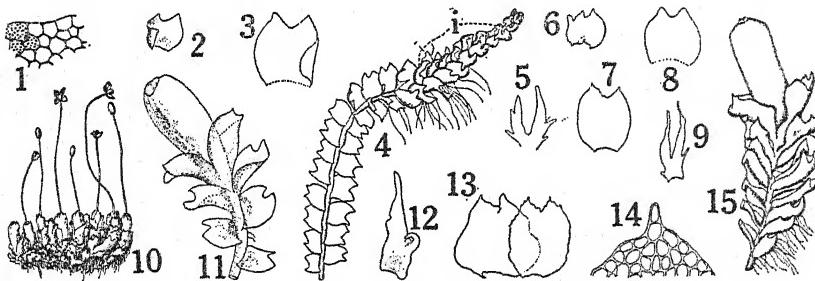
Jungermannia bantriensis var. *acuta* Lindb., Acta Soc. Sci. Fennica 10:528, 1875.

Jungermannia hornschuchiana var. *muelleri* Massal., Ann. Istit. Bot. Roma 3:8, 1888.

³⁷ mēl' lēr i.

Lophozia (subgenus *Leiocolea*) *mulleri* K. Muell., Rabenh. Krypt.-Fl. 6(1):719, 1910.

Plants in mats, green to brownish or yellowish green; leafy shoots 1-3 mm wide. Stems 1-4 cm long, prostrate to ascending, simple or sparingly branched, innovating beneath the perianth. Rhizoids numerous, present to near apex, long, colorless to brownish. Leaves succubous, the insertion quite diagonal, slightly decurrent dorsally, distant to imbricate, widely spreading horizontally to dorsally subsecund, simply 2-lobed, broadly ovate to quadrate-rotund; margin entire except for the apical lobes; lobes mostly unequal with the dorsal the smaller, ovate-triangular, acute to commonly with a 2-celled apiculus or rarely obtuse; sinus descending about $\frac{1}{4}$ the leaf length, obtuse to crescentic, often gibbose. Cells of the leaf middle 27-33 μ , of the leaf tips 25-27 μ , of the base 30-40 μ , rounded-polygonal; walls thin; trigones rather large; cuticle verruculose. Gemmae unknown. Underleaves present throughout, lanceolate to subulate, sometimes 2-lobed, quite small, with a tooth at one or both sides. Plants unisexual. Male inflorescences terminal; male plants in distinct patches or intermingled with the female, much more slender; male bracts 8-12, smaller than the leaves, somewhat dorsally secund, the dorsal margin bent forward and bearing a large tooth; antheridia 1-2, globose, among para-



Leiocolea mulleri. 1, Cells from a leaf lobe, x 62. 2-3, Male bract, dorsal lobe incurved, x 8.8. 4, Plant with male inflorescence (i) at tip, x 7. 5, Underleaf, x 26. 6, Male bract spread out, x 8.8. 7-8, Leaves, x 8.8. 9, Underleaf, x 17.6. 10, Plant, x 2.5. 11, Tip of shoot with perianth x 8.5. 12, Underleaf, x 8.5. 13, Female bracts, x 8.8. 14, Tip of leaf lobe, x 8.5. 15, Plant with perianth, x 7. (1, after Jensen; 2, 4, 6-7, 9-10, 13-15, after K. Mueller; 3, after Gil; 5, after Meylan; 8, 11-12, after Pearson.)

physes. Female bracts larger than the leaves, nearly transversely inserted, erect-spreading, oblong-ovate to rotund, $\frac{1}{6}$ - $\frac{1}{5}$ -bilobed; the lobes entire to slightly dentate with projecting cells, acute; the sinus acute to obtuse, gibbose; bracteole very small, about $\frac{1}{4}$ as long as the bracts, deeply bilobed, the lobes lanceolate, the lateral margins each with 1 to few teeth. Perianth $\frac{4}{5}$ - $\frac{5}{6}$ -emergent, cylindric to slightly pyriform, smooth, slightly plicate where suddenly to roundedly contracted to the mouth; mouth

shortly beaked, unequally ciliate. Seta 1-2 cm long. Sporangium ovoid, blackish brown; epidermal cells plate-like, with nodular thickenings; innermost wall layer of small cells with incomplete semiannular thickenings. Elaters 8-10 μ thick; spirals 2, reddish brown. Spores 10-15 μ , verrucose, reddish brown. Named in honor of the original collector, Mueller, a pharmacist.—In damp shade; on rocks or soil; from the lowlands to the subalpine regions.

ILLUSTRATIONS: Pearson (433) 2: pl. 134-135; Haynes, Bryologist 11: pl. 1, figs. 4-9, 1908; K. Mueller (409) 1: fig. 327; Macvicar (374) 170, figs. 1-5; Meylan (386) fig. 119; Gil (76) fig. 240; Jensen (323.5) 133, 4 figs.

EXAMINATIONS: Alta. Ten or fifteen miles south of Jasper National Park (Rakestrå) 1937.—N. Y. Little Moose Lake in Herkimer County (Haynes 1561) 1913.—Que. File Hills in northwestern Quebec (Macoun 1120) 1879; Gaspe (Macoun 53, 1121) 1882.

TYPE LOCALITY: Zweibrueken, Germany (Mueller^{ss}). About Lat. 48° 9' N., Long. 7° 16' E.

RANGE: Ellesmere Isl. (56.01), Miquelon Isl. (373), Conn. (212), N. Y., Que. (178), Wis. (94.1), Sask. (373), Colo. (145), Alta. (46.1), B. C. (46.1), Cal. (499.3); Asia (350); Eur. (325); Spitzbergen (56.01); Jan Mayen Isl. (320.4).

5. *Leiocolea harpanthoides*^{ss} (Bryhn & Kaal.) Buch, Evans & Verdoorn, Ann. Bryologici 10(1937):4, 1938.

Lophozia harpanthoides Bryhn & Kaal., Rept. 2nd Norwegian Arctic Exped. in the "Fram" 1898-1902, 11:31, 1906.

Plants gregarious or rarely solitary, yellowish green to dark green or blackish. Stems 1-3 cm long, moderately firm, flexuose, yellowish green to blackish, simple or with one long branch, dorsiventrally compressed, up to 280 μ in diameter; cortex of one layer of cells with thick dark walls. Rhizoids numerous, colorless or slightly yellowish. Leaves succubous, not decurrent, rather distant to usually closely imbricate, erect-spreading, curving toward the dorsal side of the stem, simply 2-lobed, ovate-quadrata to roundish quadrata, about equal in size except the lowest, up to 1 mm long and 800 μ wide, quite concave; margin entire except for the apical lobes; sinus descending $\frac{1}{6}$ - $\frac{1}{4}$ the leaf length, not gibbose, variable, rounded to crescentic or rarely acute. Cells of the leaf 15-24 μ , those of the margin about half way up a little smaller than those of the middle, roundish polygonal; walls thick, yellowish; trigones very conspicuous, strongly bulging into the cells so the cell hollow appears somewhat stellate; oil bodies very large. Gemmae rare, from the tips of the leaves, subreniform, purplish. Underleaves present throughout, either unlobed or 2-lobed, erect appressed, at apex incurved toward the stem, the tips ending in a single row of cells; when unlobed subulate-lanceolate, with 2

^{ss} We do not know which Mueller this was, but possibly Jean Baptiste Mueller.

^{ss} här pänth öi' dës.

teeth at base. Otherwise unknown. The name from *Harpanthus* and the Gk. suffix *-oides*, having the form of; in reference to its resemblance to *Harpanthus flotovianus*.—On soil or among other bryophytes.

ILLUSTRATIONS: None.

EXAMINATIONS: None.

TYPE LOCALITY: The locality mentioned first in the original report may be considered the type region. This is Framfjord, near the southeast corner of Ellesmere Island, about Lat. 76° 20' N., Long. 80° 55' W.

RANGE: Greenland (56.01), Ellesmere Island (56.01), Pim Island (56.01), North Kent Isl. (56.01).

6. *Leiocolea heterocolpa*⁴⁰ (Thed.) Buch, Mem. Soc. Fauna Fl. Fennica 8 (1932) :284, 1933.

Jungermannia heterocolpos Thed., Kgl. Sv. Vet.-Akad. Handl. 1838:52, 1839.

Jungermannia muelleri var. *heterocolpos* G. L. & N. Syn. Hep. 99, 1844.

Jungermannia muelleri var. *attenuata-gemmipara* Jack Leberm. Badens 36, 1870.

Jungermannia wattiana Aust., Bull. Torr. Bot. Club 3:11, 1872.

Jungermannia muelleri var. *danaensis* Underw., Bot. Gaz. 13:114, 1888.

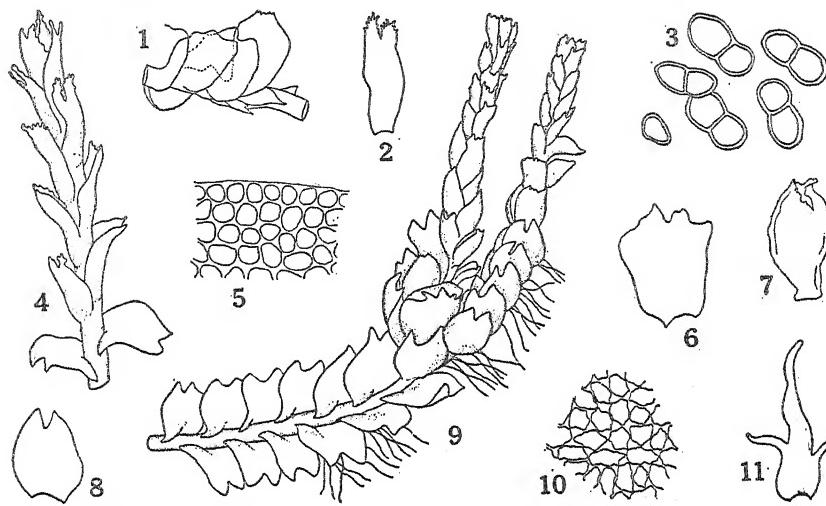
Lophozia heterocolpa Howe, Mem. Torr. Bot. Club 7:108, 1899.

Jungermannia muelleri var. *maritima* Pears. List Canadian Hep. 24, 1890.

Lophozia (subgenus *Leiocolea*) *heterocolpos* K. Muell., Rabenh. Krypt.-Fl. 6(1) :727, 1910.

Plants in patches or among mosses, green to yellowish green. Stems up to 15 mm long, procumbent to suberect, fleshy, green, or brownish beneath, simple or with few branches, innovating below the female inflorescence. Rhizoids numerous, long, brownish, present to near tip of stem. Leaves succubous, slightly decurrent on the dorsal margin, imbricate, spreading at a wide angle, rather horizontal to somewhat dorsally secund, simply 2-lobed, roundish oval to ovate; margin entire except for the apical lobes; lobes unequal, the dorsal inclined to be smaller, rounded to obtuse or acute; sinus descending $\frac{1}{4}$ – $\frac{1}{3}$ the leaf length, rather narrow, acute to obtuse or rounded, gibbose, recurved. Cells of the leaf middle 25-30 μ , of the apex 24-25 μ , of the base about 30 μ , rounded polygonal; walls thin; trigones large, the older bulging into the cells; cuticle verruculose. Gemmae at the tips of the upper leaves of attenuate apical shoots, oblong, 15-20 μ long, of 1 or commonly 2 cells, slightly constricted in the middle when 2-celled, reddish brown. Underleaves ovate-lanceolate, 1-3 cells wide, usually with 1-3 teeth on one or both margins near base, sometimes 2-lobed. Plants probably bisexual. Male inflorescence unknown. Female bracts wider than the leaves, transversely inserted, erect-spreading, roundish ovate, 2-lobed or occasionally 3-lobed, concave, undulate. Perianth about $\frac{5}{6}$ -emergent, oblong-ovoid, smooth, contracted to mouth; mouth

⁴⁰ "hět" ér ö köl' pā. K. Mueller (409) 1:727, discusses the relative merits of *heterocolpos* and *heterocolpa*. Both are correct. The latter is the more pleasing form and is in common use. The former is the original.



Leiocolea heterocolpa. 1, Piece of a plant, with perianth, x 10.6. 2, Gemmiferous leaf, x 21. 3, Gemmae, x 476. 4, Tip of gemmiferous plant, x 21. 5, Cells along leaf margin, x 132. 6, Female bract, x 13.2. 7, Perianth, x 10.6. 8, Leaf, x 13.2. 9, Part of plant with two gemmiferous tips, x 13.2. 10, Cells of the leaf middle, x 116. 11, Underleaf, x 26. (1, 7, after Underwood; 2-4, 6, 8-11, after K. Mueller; 5, after Gil.)

very shortly beaked, irregularly crenate-dentate by projecting cells. Sporangium small, ovoid. Sporophyte apparently otherwise unknown. Name from Gk. *heteros*, different, and *kolpos*, womb; probably in reference to the perianth as compared with *L. muelleri*.—On rock ledges, on soil, on logs, in ditches.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 329; Thedenius, Kgl. Sv. Vet.-Akad. Handl. 1838: pl. 1, 1839; Underwood, Bot. Gaz. 13: pl. 6, 1888; Macvicar (374) 173, figs. 1-7; Meylan (386) fig. 122 a-c, e-f; Gil (76) fig. 243.

EXAMINATIONS: Alta. Banff National Park (Rakestraw) 1937.—Ida. Cascade (Frye) 1933.—Mont. Glacier National Park (Frye) 1929.—Ore. Mt. Hood (Frye) 1933.—Wash. Friday Harbor (Daugherty) 1925; Spieden Island in San Juan County (Clark) 1925.

TYPE LOCALITY: European.

RANGE: Greenland (322), Ellesmere Isl. (168), Que. (431), Me. (363), Vt. (185), Ont. (373), Mich. (213), Wis. (94), Minn. (168), Sask. (431), Mont. (81), Alta. (431), Yukon (298), Alaska (168), B. C. (371), Ida. (82), Wash. (81), Ore. (84), Calif. (296); Asia (350); Eur. (325).

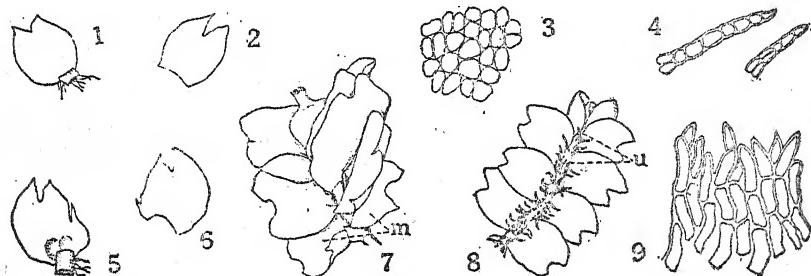
The only report of a sporophyte, so far as we know, is by Stephani (491) and that is too meager to be of value.

7. *Leiocolea gillmani*⁴¹ (Aust.) Evans, Bryologist 38:83, 1935.*Jungermannia gillmani* Aust., Bull. Torr. Bot. Club 3:12, 1872.*Jungermannia kaurini* Limpr., Jahresb. Schles. Ges. Vaterl. Kult. 61:204, 1884.*Lophosia kaurini* Steph., Bull. Herb. Boissier, Ser. 2, 1:1147, 1901; and Sp.

Hep. 2:130, 1901.

Lophosia (subgenus *Leiocolea*) *kaurini* K. Muell., Rabenh. Krypt.-Fl. 6(1):716, 1910.*L. kaurinii* Joerg., Bergens Mus. Skrift. 16:161, 1934.

Plants in rather large lax mats, green to yellowish green; leafy branches 2-3 mm wide. Stems 2-4 cm long, almost prostrate to suberect, simple or branched from the base, innovating below the female inflorescence. Rhizoids numerous, present to near tip of stem, long, colorless to brownish. Leaves succubous, little or hardly decurrent, distant to rather closely imbricate, horizontally widely spreading to dorsally secund, 2-lobed, oblong-quadrata to broadly ovate; margin entire except for the 2 ter-



Leiocolea gillmani. 1-2, Leaves, x 8.5. 3, Leaf cells, x 302. 4, Two underleaves, x 92. 5-6, Male bracts, x 8.5. 7, Tip of shoot with perianth and male bracts (m), x 46. 8, Sterile shoot, ventral view, with underleaves (u), x 46. 9, Mouth of perianth, x 92. (1-2, 5-6, after K. Mueller; 3-4, 7-9, after Lorenz.)

minal lobes; lobes inclined to be unequal with the dorsal the smaller, from often acute and sharply pointed to obtuse and rounded at tip; sinus descending $\frac{1}{5}$ - $\frac{1}{4}$ the leaf length, very variable, acute to commonly obtuse, sometimes crescentic. Cells of the leaf middle 34-42 μ , of the tips of the lobes about 30 μ , of the base 35-50 μ ; rounded-polygonal; walls thin; trigones rather small but distinct; cuticle coarsely verruculose. Gemmae unknown. Underleaves subulate to lanceolate, sometimes with one or more teeth on the margin. Plant bisexual. Male inflorescence below the female on the same branch; male bracts larger than the leaves, 8-12, transversely inserted, keeled, hardly saccate at base, almost circular, dorsal lobe the smaller; dorsal margin entire or 1-toothed near base, incurved or bent forward; antheridia 1-2, ovoid-globose, with short stalk. Female

⁴¹ gil' mān'i. Joergensen (325), and also Buch, Evans & Verdoorn, Ann. Bryol. 10(1937):4, 1938, spell it *gillmanii*. We return to the original spelling.

inflorescence terminal; female bracts similar to the leaves but larger, transversely inserted, imbricate, erect-spreading, concave, undulate, rounded-ovate to oblong-ovate, mostly saccate at base; the dorsal margin often with a small rounded lobe; the sinus quite gibbose; bracteole lanceolate, with a tooth on each margin near base. Perianth about $\frac{5}{6}$ -emergent, almost cylindric, smooth except where contracted to the mouth, several cells thick at base; mouth rather longly beaked, somewhat 4-lobed, shortly and unequally ciliolate. Sporangium ovoid, blackish brown. Elaters about 8μ wide; spirals 2, reddish brown. Spores about 15μ , minutely punctate, dark brown. Named in honor of Henry Gillman, the original collector.—On damp rocky ledges.

ILLUSTRATIONS: Lorenz, Bryologist 14:29, pl. 4, 1911; K. Mueller (409) 1: fig. 326; Macvicar (374) 174, figs. 1-5; Meylan (386) fig. 123 (we have seen no trigones as large as he shows in "c" of his figure).

EXAMINATIONS: Mich. Isle Royale (C. E. Allen & S. C. Stentz 937a) 1901.—Mont. Glacier National Park (Frye) 1929.—Ore. Hoodspur (DuVall) 1935.—Vt. Hartland (Dutton) 1910.—Wash. Fish Lake near Roslyn (Frye) 1936; Friday Harbor (Clark) 1925.

TYPE LOCALITY: In a cave of Potsdam sandstone on Au Train Island, a part of Alger County, Michigan, in Lake Superior (Henry Gillman) 1867. The island is about Lat. $46^{\circ} 29'$ N., Long. $86^{\circ} 53'$ W.

RANGE: N. S. (413), Me. (171), N. H. (185), Vt. (362), Que. (178), Ohio (94.3), Mich. (504), Wis. (98), Minn. (94.4), Mont. (82), Alta. (51), Yukon (362), Alaska (190), B. C. (371), Wash. (81), Ore.; Asia (350); Eur. (409).

8. *Leiocolea rutheana*⁴² (Limpr.) n. comb.

Jungermannia schultzii Nees Naturg. Eur. Leberrm. 2:30, 1836. Not of Spreng. Pugil. 1:64, 1813.

Jungermannia rutheana Limpr., Jahresb. Schles. Ges. Vaterl. Kult. 61:207, 1884.

Jungermannia lophocoleoides Lindb., Medd. Soc. Fauna Fl. Fennica 14:66, 1887.

Lophozia rutheana Howe, Bull. New York Bot. Gard. 2:102, 1901.

Lophozia schultzii Schiffn., Verh. Zool.-Bot. Gesell. Wien 59:387, 1909.

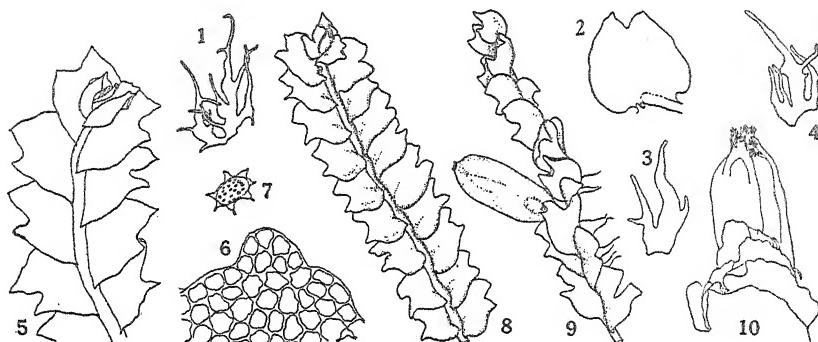
Lophosia (subgenus *Leiocolea*) *schultzii*⁴³ K. Muell., Rabenh. Krypt.-Fl. 6(1):713, 1910.

L. schultzii Joerg., Bergens Mus. Skrift. 16:161, 1934.

Plants in tufts or sods, or scattered among mosses, reddish brown, strongly aromatic when fresh; leafy shoots 3-4 mm wide. Stems 4-8 cm long, erect to suberect, flexuous, green or on the underside brown, simple or slightly branched. Rhizoids numerous, present to near the apex, short, pale yellowish brown. Leaves succubous, very obliquely inserted, shortly decurrent dorsally, imbricate, widely spreading, almost horizontal to somewhat recurved dorsally, simply 2-lobed, triangular-ovate, about 3 mm wide, wider than long, about half embracing the stem, asymmetrical, flaccid; ventral margin often with 1-4 small teeth on the rounded base;

⁴² rüth ē ä' nä.

⁴³ Omitting one of the final i's.



Leiocolea rutheana. 1, Underleaf, x 8.5. 2, Leaf, x 6.4. 3-4, Underleaves, x 5.3. 5, Sterile tip of plant, x 5.3. 6, Cells at tip of lobe of leaf, x 76. 7, Leaf cell showing verruculose cuticle, x 76. 8, Part of a sterile shoot, x 4.2. 9, Part of plant with perianth, x 4.2. 10, Tip of shoot with perianth, x 5.3. (1-2, 6-9, after K. Mueller; 3-5, 10, after Jensen.)

margins otherwise entire except for the apical lobes; dorsal margin strongly reflexed; lobes unequal, of somewhat different form or usually the dorsal somewhat the smaller, broadly triangular, obtuse to subacute; sinus descending $\frac{1}{5}$ - $\frac{1}{4}$ the leaf length, broadly acute to rounded or crescentic, gibbose, recurved. Cells of the leaf middle 35-40 μ , of the margin about 30 μ , of the base about 33 by 45 μ , roundish polygonal or rectangular-oval toward the leaf base; walls thin; trigones rather large, in old leaves sometimes bulging into the cells; cuticle coarsely striate-verruculose. Gemmae unknown. Underleaves large, lanceolate to ovate but divided to near the base or less deeply into 3-5 segments each ending in a cilium, the middle segment the longest, the margins often with distant cilia. Plants bisexual. Male inflorescence below the female one; male bracts like the leaves, shortly below the perianth, somewhat dorsally secund so their sides approach each other adaxially; antheridia 1-3 in or near each axil, often among lanceolate paraphyses. Female inflorescence terminal, female bracts like the leaves or a little larger, less obliquely inserted, both dorsal and ventral margins frequently with 1-4 teeth or cilia at base. Perianth about $\frac{5}{6}$ -emergent, large, subcylindric or clavate, somewhat compressed, otherwise smooth, suddenly contracted to the mouth; mouth shortly to not at all beaked, shortly ciliate, the cilia of 1-2 elongate cells. Seta 3-5 cm long. Sporangium oblong-ovoid, dark brown, its wall of 3-4 layers of cells; epidermal layer of large cells with nodular or semiannular thickenings; inner layers of small cells, with semiannular thickenings. Elaters 50-100 μ long, 8-10 μ thick; spirals 2, closely coiled, reddish brown. Spores 12-20 μ , light brown. Named in honor of R. Ruthe, who

gathered a lot of it in 1872 for Gottsche & Rabenh. Exsic. No. 583.— Plants on very wet or springy ground.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 325; Jensen (323.5) 133, 4 figs.

EXAMINATIONS: None.

TYPE LOCALITY: Neubrandenburg, Germany (Schultz); about Lat. 53° 37' N., Long. 13° 15' E.

RANGE: Minn. (325), Yukon (325); Asia (350); Eur. (325).

*ANASTROPHYLLUM*⁴⁴ (Spruce) Steph., Hedwigia 32:140, 1893.

Jungermannia subgen. *Anastrophyllum* Spruce, Jour. Bot. 14:234, 1876.

Plants forming mats, large, reddish yellow to purple. Stems 2-5 cm long, simple or with few branches; branches arising from the ventral part of the leaf axil. Rhizoids none or few. Leaves succumbous by the ventral half of the insertion, the dorsal half transverse or very nearly so, with secund dorsal margin, concave, simply 2-lobed; margin entire; lobes acute, equal or the ventral one the larger. Cells of leaves with thick walls; trigones large, often bulging into the cells, often confluent. Underleaves usually wanting. Plants unisexual. Male inflorescence terminal or lower down; male bracts imbricate, saccate at base; antheridia 2-4 in each axil. Female bracts rather larger than the leaves, often denticulate or laciniate. Perianth narrowly oblong or ovoid to clavate or pyriform, terete below, plicate and narrowed above; mouth lobed to lacinate or ciliate. Seta short. Sporangium ovoid. Name from Gk. *ana*, back, *strepheo*, turn, and *phylon*, leaf; apparently in reference to the secund upper leaf margin.

Leafy shoots 2-3 mm wide; leaves not decurrent, the lobes about equal, cuticle finely papillate; perianth suddenly rounded to the mouth.....

1. *A. michauxii*.

Leafy shoots 1-1.5 mm wide; leaves slightly decurrent dorsally, the ventral lobe the larger, cuticle smooth; perianth gradually contracted to the mouth.....

2. *A. reichardti*.

1. *Anastrophyllum michauxii*⁴⁵ (Weber) Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):284, 1933.

Jungermannia michauxii Weber Hist. Musc. Hep. Prodr. 76, 1815.

Jungermannia densa Nees Naturg. Eur. Leberm. 2:143, 1836.

Jungermannia minuta var. *procera* Nees Naturg. Eur. Leberm. 2:444, 1836.

Jungermannia anacampa Tayl., London Jour. Bot. 5:273, 1846.

Sphenolobus michauxii Lindb., Acta Soc. Sci. Fennica 10:261, 1872.

Sphenolobus michauxii Steph., Bull. Herb. Boissier, Ser. 2, 2:172, 1902; also Sp. Hep. 2:164, 1902.

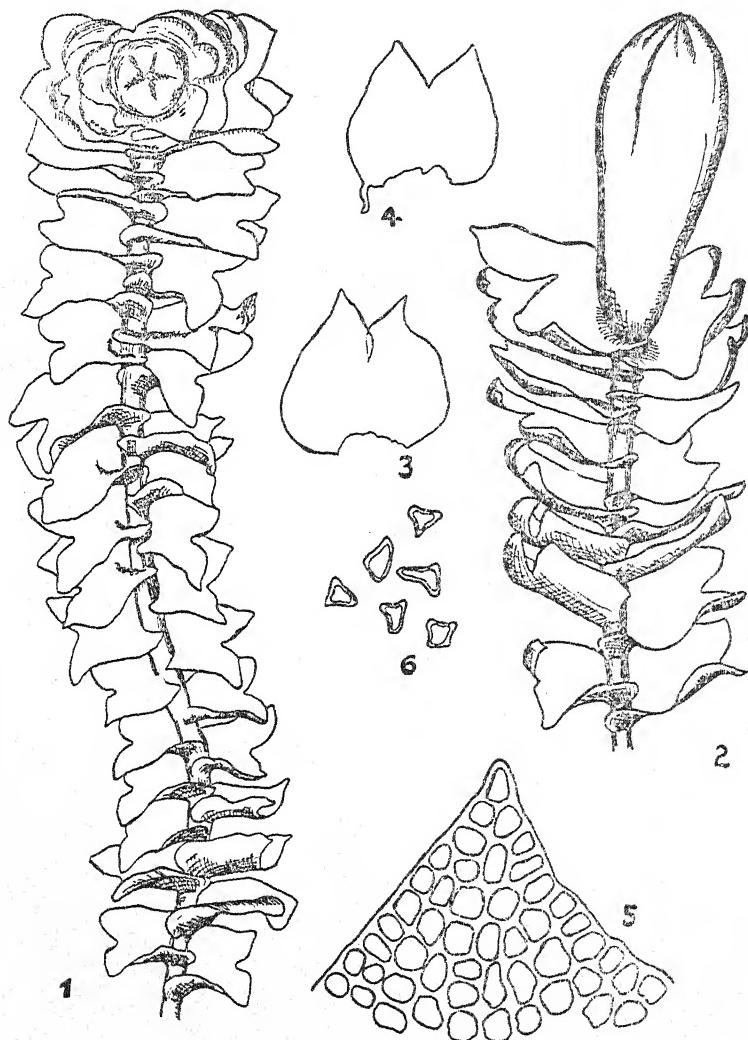
Diplophyllum michauxii Loeske Moosfl. Harzes 64, 1903.

Lophosia michauxii Boulay Musc. France 2:105, 1904.

⁴⁴än äs" trö fil' läm

⁴⁵mi shō' ii.

Plants forming dense mats, brownish green to green, the leafy shoots 2-3 mm wide. Stems up to 5 cm long, prostrate to ascending or erect, usually unbranched, sometimes with a subfloral tuft of branches toward the tip, many of the branches arising ventrally; subfloral branches up to 4 cm long. Rhizoids many. Leaves succubous, not decurrent, somewhat imbricate and more so near the tip, spreading nearly at right angles with



Anastrophyllum michauxii. 1, Shoot with young perianth, dorsal view, x 25. 2, Tip of shoot with mature perianth, x 25. 3, Leaf, x 25. 4, Male bract, with tooth at base of dorsal margin, x 25. 5, Cells of a leaf tip, x 300. 6, Six gemmae, x 300. (All after Clark & Frye.)

the stem, simply 2-lobed, broadly ovate to almost quadrate, more than half-clasping the stem; lobes about equal, most of them acute; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, right-angled to acute; margin entire or rarely somewhat sinuate, often undulate. Cells of the leaf middle about 12-21 μ , of the margin 10-18 μ and not unlike those of the second row, near the tip of the leaf about 10 μ , roundish; walls thick, yellowish brown; trigones distinct, large, sometimes confluent; cuticle finely papillate. Gemmae on the terminal buds of sterile or male plants, clustered at the tips of leaves which thus become erose, about 12 x 20 μ , 3-4-angled, 1-2-celled, reddish, thick walled. Underleaves wanting. Plants unisexual. Male plants smaller than the female ones, often in separate mats, with several successive inflorescences on the same stem; male bracts 10-12, cleft to $\frac{1}{4}$ down, saccate at base; antheridia 2-3, among paraphyses. Female bracts larger than the leaves but grading into them, widely spreading, deeply 2-lobed, the lobes occasionally with a third tooth; bracteole wanting or small and lanceolate. Perianth usually terminal, occasionally appearing dorsal through rejuvenation of the shoot, not united with the bracts, wholly exserted, pyriform to clavate, up to 3 mm long, smooth, suddenly contracted above, slightly 5-6-plicate; mouth whitish, lobed, the lobes lacinate. Sporangium ovoid. Elaters about 110 μ long, scarcely attenuate; spirals 2, narrow, loosely wound. Spores 10-13 μ , minutely papillate, reddish brown. Named in honor of Andre Michaux, who first discovered it.—On wet or rotting wood, on soil or rocks; in woods or other damp places.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 292; Clark and Frye (81) 90, figs. 1-6; Ammons (3.1) 142, fig. C.

EXAMINATIONS: B. C. Mt. Thamloops (Brinkman 279) 1910; Revelstoke (Macoun 229) 1890.—Ida. Craig Mountain (Clark 83) 1924.—N. S. North West Arm (Macoun 98, 1313) 1883.—Ont. Belleville (Macoun 43) 1868; Cache Lake in Algonquin National Park (Macoun) 1900; Lake Nipigon (Macoun 63) 1883.—Tenn. Mt. Le Conte in Sevier County (Sharp 4127) 1941.—Que. Lead Lake (A. P. Low 1637) 1896; St. Ann River in Gaspe (Macoun 33) 1882.—Wyo. Norris Basin in Yellowstone National Park (Frye) 1925.—Yukon. Hunker Creek (Macoun) 1902.

TYPE LOCALITY: In Canada and Carolina (A. Michaux).

RANGE: Labrador (373), N. S. (413), Me. (369.1), N. H. (140), Vt. (169), Mass. (156), Conn. (169), N. Y. (504), Que. (178), Ont. (373), Mich. (213), Wis. (94.1), Minn. (94.1), Wyo. (446), Alta. (46.2), Yukon (51), Alaska (213), B. C. (46.1), Ida. (81), Wash. (431), Tenn. (464), N. C. (10), Va. (127), W. Va. (3.1); Asia (491); Eur. (409).

The species name is written with one final "i" or with two. We do not have access to Weber's original description and therefore do not know his spelling. We follow the general usage of "ii."

2. *Anastrophylleum reichardti*⁴⁶ (Juratzka) Steph., Hedwigia 32:140, 1893.

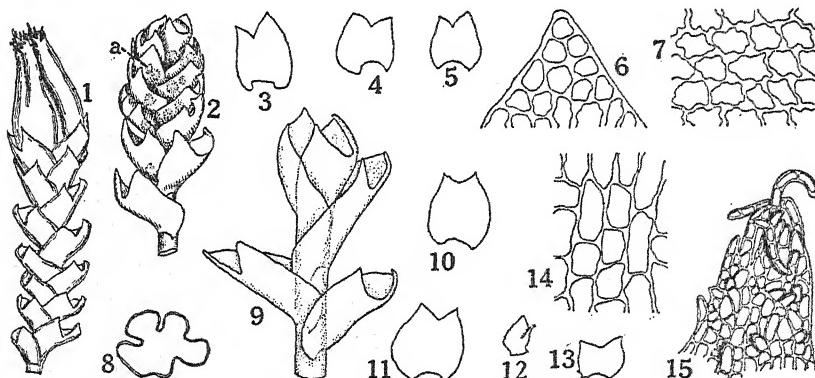
Jungermannia reichardii Gottsche, Juratzka in Hedwigia 9:34, 1870;⁴⁷ also Verh. Zool.-Bot. Gesell. Wien 20:168 (May 31), 1870.

Jungermannia nardooides Lindb. Musci Scand. 8, 1879.

Jungermannia minuta var. *robusta* Massal. & Cares, Nuovo Giorn. Bot. Ital. 12:333, 1880.

A. nardooides Kaal., Vid. Skrift. I. Math. Nat. Klasse 1 (9):18, 1898.

Plants in dense mats or among mosses, brownish green to almost black, glossy, the leafy shoot about 1-1.5 mm wide. Stems 2-5 cm long, rigid, blackish brown, prostrate to erect, curved toward the ventral side at the tip, fasciculately branched. Rhizoids rather few to none, wanting toward tip of stem, hyaline to brownish. Leaves succubous, slightly decurrent dorsally, more or less imbricate, spreading to erect-spreading, simply 2-lobed, convex on back, arching beyond the stem, ovate to somewhat quadrate, about 900 μ long and 800 μ wide; margin entire; lobes unequal, acute, the ventral one the larger; sinus descending about $\frac{1}{3}$ the leaf length, right-angular to acute. Cells of the leaf middle 15-20 μ , of the margin about 14 μ , of the base about 17 by 35 μ , in rather definite rows; walls thick, yellowish; trigones present, large, the cell lumen often stellate near margin and base of leaf; cuticle smooth. Gemmae unknown. Underleaves wanting. Plants unisexual. Male plants clavate; male bracts 12-20, strongly concave, with 1-2 small teeth on the basal region of the ventral margin; antheridia 2, with a few paraphyses. Female bracts slightly larger than the foliage leaves, wider at base; bracteole linear,



Anastrophylleum reichardti. 1, Part of plant with perianth, dorsal view, x 9.6. 2, Male inflorescence, dorsal view, with antheridia (a), x 14.3-3.5. Leaves, x 9.6. 6, Tip of lobe of leaf, x 154. 7, Cells of leaf middle, x 154. 8, Cross section of perianth in upper third, x 17. 9, Tip of shoot, dorsal view, x 27. 10-11, Female bracts, x 9.6. 12, Dorsal base of male bract, x 17. 13, Male bract, x 8.5. 14, Cells from near base of leaf, x 154. 15, Part of the mouth of the perianth, x 122. (9, after Buch; all others after Evans.)

⁴⁶ rik' ärt i. Juratzka used the ending "i"; Stephani used "ii." We return to the original.

⁴⁷ Since there were 12 numbers of Hedwigia in 1870, and page 34 is in the 3rd number, it was probably printed in March, 1870.

2-lobed. Perianth ovoid, about 2.2 mm long, and 1 mm wide, hyaline at mouth, deeply 4-5-plicate above, gradually narrowed above to mouth; mouth lacerate with ciliate divisions; the cilia slender, variously curved and contorted, 1-2 cells long. Sporophyte unknown. Named in honor of Dr. H. W. Reichardt, who first found it.—On rocks in damp shady places at high altitudes.

ILLUSTRATIONS: Evans, Proc. Washington Acad. Sci. 2: pl. 16, figs. 4-17, 1900; K. Mueller (409) 1: fig. 289; Meylan (386) fig. 88; Juratzka, Verh. Zool.-Bot. Gesell. Wien 20: pl. 3B, 1870.

EXAMINATIONS: None.

TYPE LOCALITY: "In den Sechauer Alpen am Zinken" at 1900-2350 meters, in Steiermark, Germany (Dr. H. W. Reichardt).

RANGE: Alaska (135); Eur. (458).

*ANASTREPTA*⁴⁸ (Lindb. & Arn.) Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1 (3) :85, 1893.

Mesophylla Dum. Syll. Jung. Eur. 80, 1831, in small part.

Jungermannia section *Anastrepta* Lindb. & Arn., Kgl. Sv. Vet.-Akad. Handl. 23(5):40, 1889.

Plants tall. Stems erect, simple to little branched, usually innovating beneath the female inflorescence. Rhizoids few except toward base of stem. Leaves alternate, the ventral half very succubously inserted, the dorsal half almost transverse, simply and shortly 2-lobed, the ventral margin widely recurved. Cells of the leaves small; trigones large. Under-leaves none or small. Plants unisexual. Male bracts with a tooth at base of dorsal margin. Female bracts 2-lobed to irregularly lacerate, the upper two with margins not revolute. Perianth broadly clavate or narrowly pyriform, 4-plicate near tip, roundedly contracted to mouth; mouth with 4 teeth or lobes, these ciliate. Seta in cross section 10 cells thick, the innermost and the epidermal cells somewhat larger than the intermediate ones. Sporangium wall of 5 layers of cells, the cells all about the same in size, with heavy annular thickenings especially in the innermost layer. Name from Gk. *anastrepho*, to turn back; in reference to the strongly recurved ventral margin of the leaf.

There is only one species.

1. *Anastrepta orcadensis*⁴⁹ (Hook.) Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1 (3) :85, 1893.

Jungermannia orcadensis Hook. Brit. Jung., pl. 71, 1816.

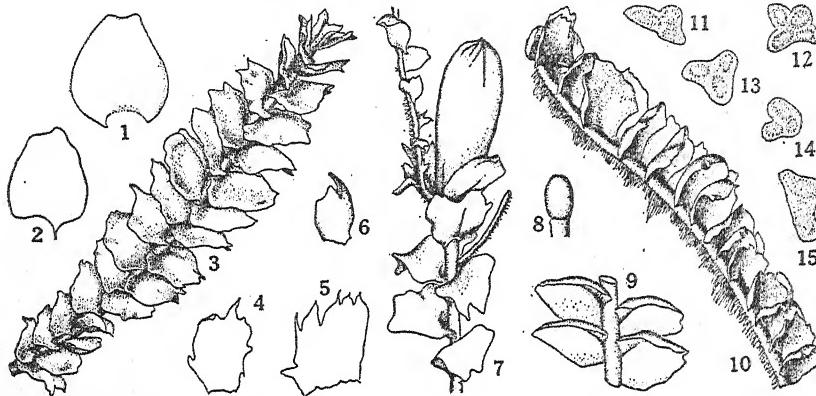
Mesophylla orcadensis Dum. Hep. Eur. 130, 1874.

Plants in loose patches or mats, bluish green to yellowish or reddish brown, sometimes blackish. Stems 4-10 cm long, vigorous, erect, usually

⁴⁸ än ä strĕp' tă.

⁴⁹ ör kă dĕn' sis.

simple, sometimes with a few branches from ventral half of axils of leaves, innovating below the female inflorescence. Rhizoids usually abundant near base of stem, common to near tip, short. Leaves distinctly succubous, dorsally decurrent, rather loosely imbricate to rather densely so, erect-spreading with the apex widely spreading to squarrose, simply 2-lobed, obliquely cordate-ovate, widest near base, the base dorsally con-



Anstrepta orcadensis. 1, Leaf, x 10.5. 2, Leaf, x 6.3. 3, Sterile plant, x 5.3. 4-5, Female bracts, x 6.3. 6, Female bracteole, x 6.3. 7, Part of plant showing perianth, x 5.3. 8, Sporangium, x 5.3. 9, Part of plant, ventral view, showing revolute ventral margin of leaf, x 5.3. 10, Tip of sterile plant, side view, x 5.3. 11-15, Gemmae, x 320. (1, after Gil; others after K. Mueller.)

vex, grading into dorsally concave at leaf tip, slightly dorsally secund, narrowed at apex, dorsal margin slightly reflexed, ventral margin widely so; margins entire or occasionally with a tooth near base of dorsal margin; lobes slightly unequal, the larger ventral, broadly triangular, acute to obtuse or rounded; sinus descending $\frac{1}{10}$ - $\frac{1}{6}$ the leaf length, obtuse to crescentic. Cells of the leaf middle 15-25 μ , of the margin about 14 μ , roundish oblong, densely chlorophyllose; walls thin between the trigones; trigones large; oil bodies 1-2; cuticle smooth. Gemmae in clusters on the tips of the leaf lobes, irregularly angular or oblong, 2-celled, about 15-25 μ , reddish purple. Underleaves wanting or fungaceous, small, subulate, 2-3 cells wide. Plants unisexual. Male plants in separate patches; male inflorescence terminal or farther down; male bracts 6-10, smaller than the leaves, saccate at base, 2-lobed; the lobes mere teeth, obtuse; the dorsal margin with a tooth at base; antheridia 1-2, with short stalk; paraphyses lanceolate. Female inflorescence terminal on main shoot; female bracts irregularly and acutely lobed, oblong; bracteole oblong, irregularly and incisely lobed. Seta about 1 cm long, about 10 cells thick, the cortical and central ones larger than the intermediate ones; epidermal cells chlorophyllose, the others hyaline. Sporangium oblong, blackish brown, the wall of

5 layers of cells much the same in size, with strong annular thickenings especially in the innermost layer. Elaters about 8μ thick; spirals 2, reddish brown. Spores about 10μ , minutely verruculose, reddish brown. Name from L. *orcadus*, the Orkney Islands, and *ensis*, pertaining to; it was first found on these islands.—On humus or other soil, on banks or rocks; in wet places in alpine or subalpine regions.

ILLUSTRATIONS: Hooker (285) pl. 71; Joergensen, Bergens Mus. Aarbog 18: 1 pl., 1895; K. Mueller (409) 1: fig. 336-337; Pearson (433) 2: pl. 155; Ekart (124) pl. 5, fig. 39; Meylan (386) fig. 126; Gil (76) fig. 246; Macvicar (374) 221, figs. 1-4; Jensen (323.5) 139, 3 figs.

EXAMINATIONS: None.

TYPE LOCALITY: Top of Wart Hill, Island of Hoy, in the Orkneys (Hooker) 1808.

RANGE: Alaska (173); Hawaiian Islands (173); Asia (409); Eur. (374); Faroe Islands (409).

*ACROBOLBUS*⁵⁰ G. L. & N. Syn. Hep. 5, 1844.

Gymnanthe G. L. & N. Syn. Hep. 192, 1844.

Plants yellowish green. Stem prostrate, simple or branched, the female one forming a fleshy sac (marsupium) at the tip; branches from dorsal half of axils of normal or intercalary leaves. Rhizoids present. Leaves quite succubous, widely spreading, simply and unequally 2-3-lobed with the ventral lobe the larger; lobes acuminate, those near the inflorescence erect-connivent; sinus deep. Cells of the leaves thin walled; trigones small to prominent. Underleaves wanting or rare, small. Plants unisexual. Male inflorescence intercalary, not terminal. Female bracts larger than the leaves, crispatate, 2-lobed; the margins sharply toothed; the lobes acuminate; bracteole wanting. Perianth wanting. Archegonia surrounded by minute leaves. Perigynium terminal, at right angles to the axis of the stem, with numerous rhizoids. Calyptra adnate with the inner wall of the perigynium. The name from Gk. *akros*, highest, and *bolbos*, onion; in reference to the perigynium at the apex of the stem.

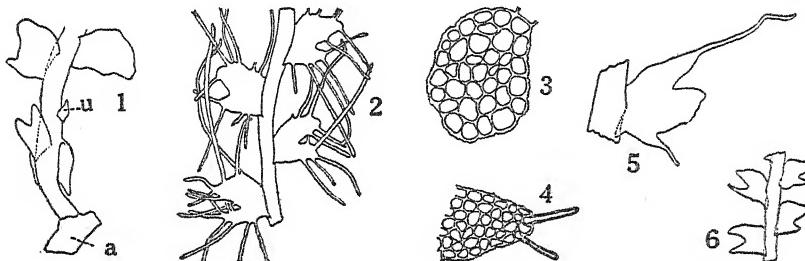
The generic description of the gametophyte includes *A. rhizophyllus*, but the sporophytic and reproductive characters are all based upon the European *A. wilsonii*.

1. *Acrobolbus rhizophyllus*⁵¹ Sharp, Bryologist 39:1, 1936.

Plants intermingled with other liverworts and mosses, yellowish green. Stems 1-3 cm long, prostrate, simple or with scattered branches; branches intercalary, similar to the stem but sometimes with reduced leaves; in cross section of stem the cells all similar, their walls moderately

⁵⁰ ák rō bōl' būs.
⁵¹ rī zō' fil lūs.

thick and their trigones moderately large; cuticle verruculose. Rhizoids on the stem few, on the margins of the leaves wanting to abundant although their absence seems to be associated with the youth of the leaves. Leaves quite succubous, not to slightly decurrent dorsally, not at all ventrally,⁵² distant, horizontally spreading, simply 2-lobed or rarely 3-lobed; margin often with rhizoids, otherwise entire or 1-toothed, the tooth sometimes large enough to be the third lobe; lobes unequal, the ventral one the



Acrobolbus rhizophyllus. 1, Basal portion of young branch with underleaf (u), from old stem (a), x 39. 2, Part of sterile plant, dorsal view, x 21. 3, Cross section of stem, x 137. 4, Cells of leaf tip, x 64. 5, Leaf with 3 lobes, x 39. 6, Part of young plant with little rhizoid formation, x 13.2. (All after Sharp.)

larger. Cells of the leaves 24-35 μ , oblong to isodiametric; trigones small to prominent; cuticle coarsely verruculose. Underleaves rare, on the basal part of the branches, small, unlobed to 3-lobed. Reproduction and sporophyte unknown. Name from Gk. *rhiza*, root, and *phyllon*, leaf; in reference to the rhizoids on the leaf margins.—On vertical faces of siliceous rock and cliffs; on wet rocks below waterfall.

ILLUSTRATIONS: Sharp, Bryologist 39: pl. 1, 1936; also Jour. S. Appalachian Bot. Club 3: pl. 1, fig. 5, 1936.

EXAMINATIONS: Tenn. Sevier County (Sharp 35177) 1936; also Verdoorn, Hep. Selectae et Crit. Exsic, No. 451, from the same county.

TYPE LOCALITY: Roaring Fork Creek on Mt. LeConte in Great Smoky Mountains National Park, Tennessee (A. J. Sharp 34501) May 13, 1934, at 5000 feet.

RANGE: Tenn. (465), N. C. (43).⁵³

The description is disappointingly brief. Naturally the reproduction and sporophyte are needed to determine its genus with certainty. The gametophytic structures need comparison point by point with those of *A. wilsonii* of Europe, which is fairly described by Macvicar (374) although it lacks detail especially in structure of stem, seta and sporangium. In general appearance it suggests *Lophocolea*.

⁵² Sharp's drawings do not show it decurrent ventrally, but show a suggestion of it dorsally.
⁵³ Spelled *Acrobolus*, apparently a misprint.

ORTHOCAULIS⁶⁴ Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):293, 1933.

Barbilophozia Loeske, Verh. Bot. Ver. Brandenburg 49:37, 1907, in larger part.

Lophozia subgenus *Barbilophozia* K. Muell., Rabenh. Krypt.-Fl. 6(1):622, 1910, in larger part.

Jungermannia section *Kunzeanae* C. Jensen Danmarks Mossor, Bryofyter 1:106, 1915, exclusive of certain species.

Jungermannia subgenus *Barbilophozia* Arn., Arkiv f. Botanik 19(10):22, 1925, in larger part.

Stems prostrate to erect, 1-6 cm long, branches wanting to few; dorsal cortical cells in 1-2 layers, shorter than the leaf cells; ventral cortical cells in 1-2 layers, shorter and narrower than the leaf cells; interior cells much longer and wider than the cortical ones; ventral epidermis composed of 4 or more rows of surface cells, or of only 2 when underleaves are wanting. Leaves succubous or near the female bracts transverse and the insertion curved ventrally near its anterior end, dorsally or not at all decurrent, distant to imbricate, erect to spreading, simply 2-4-lobed, those from the middle region of the sterile shoots widest at or above the middle except sometimes in *O. elongatus*; margin except for terminal lobes entire or with 1-4 teeth or cilia near ventral base, more rarely also near dorsal base; the teeth or cilia composed of isodiametric cells; lobes oblong or ovate to triangular, bluntly acute or ending in an equilaterally triangular cell, somewhat unequal, their margins recurved, the two ventral lobes somewhat smaller and homologous with the ventral half of a 2-lobed leaf; in 2-lobed leaves the ventral lobe the wider; sinuses descending $\frac{1}{4}$ - $\frac{1}{2}$ the leaf length, often somewhat gibbose, the ventral usually shallower. Cells of the leaf middle 15-30 μ , isodiametric, those near base longer than wide; walls thin or slightly thickened; trigones usually small to large, rarely wanting, rarely bulging; cuticle smooth to verruculose or striate-verruculose. Gemmae not limited to the tips of the leaves but forming anywhere on the leaf lobes, 1-2-celled; gemmiparous leaves remaining small, gemmiparous shoots more tenuous and erect. Underleaves wanting to moderately abundant, deeply 2-lobed when large, otherwise entire to toothed or ciliate. Plants unisexual or bisexual. Male inflorescence terminal or farther down the stem; antheridia 1-3. Female bracts 3-5-lobed; bracteole present. Perianth free from the bracts or in *O. elongatus* sometimes united with it for a short distance from its base, plicate to near middle or less, contracted to mouth; mouth variously indented. The name from Gk. *orthos*, straight, and *kaulon*, stem; reason not clear.

A. Leaves of the middle region of the sterile shoots most commonly 2-lobed

B. Leaves dorsally secund; underleaves rare, entire except for bilobing; dorsal and ventral bases of leaf margins both entire, plants unisexual; perianth free from the bracts..... 2. *O. binsteadii*.

⁶⁴ ór thō kāl' īs.

- BB. Leaves not dorsally secund; underleaves often with a tooth at one or both margins; one or both the leaf margins sometimes toothed at base.
- C. Leaf sinus obtuse to crescentic; plants bisexual; base of perianth usually united with the bracts; underleaves rather scarce.....
- CC. Leaf sinus acute; plants unisexual; perianth free from the bracts; underleaves common.....
- AA. Leaves of the middle region of the sterile shoots most commonly 3-lobed.
- D. Underleaves entire or with one tooth on each side; ventral and dorsal bases of leaf margin both entire.
- E. Innovation not terete; leaves semicylindric on account of the incurved margins.....
- EE. Innovations terete on account of the closely appressed imbricate leaves; leaves not semicylindric.....
- DD. Underleaves ciliate; ventral base of leaf margin ciliate, dorsal one entire.....
- AAA. Leaves of the middle region of the sterile shoots most commonly 4-lobed; underleaves ciliate; ventral and dorsal bases of leaf margin each 1-3-toothed or ciliate.....

1. *Orthocaulis elongatus*⁵⁵ (Lindb.) Buch, Evans and Verdoorn, Ann. Bryologici 10(1937) : 4, 1938.

Jungermannia elongata Lindb., Medd. Soc. Fauna Fl. Fennica 9:162, 1883.

Lophozia elongata Steph., Bull. Herb. Boissier, Ser. 2, 2:41, 1902; also Sp. Hep. 2:41, 1902.

1. *O. elongatus*.

3. *O. kunzeanus*.

4. *O. atlanticus*.

5. *O. gracilis*.

6. *O. floerkii*.

7. *O. quadrilobus*.

Plants in patches or singly among other bryophytes, yellowish green. Stems 1-2 cm long, flexuous, branched toward tip, often white, often with flagelliform branches. Rhizoids numerous. Leaves succubous, distant to loosely imbricate, erect-spreading, simply 2-lobed or some 3-lobed, broadly ovate to roundish quadrate, larger upward toward the perianth, dorsal margin often and ventral margin sometimes with one large triangular tooth; lobes unequal, the ventral the larger, broadly lanceolate, acute to obtuse, slightly incurved toward the stem; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, obtuse to crescentic. Cells of the leaf middle 20-30 μ , of the apex and margin 20-25 μ , of the base about 18 by 40 μ ; walls thin; trigones wanting or minute; cuticle smooth. Gemmae unknown. Underleaves usually present, lanceolate, 2-lobed or with a tooth on each basal margin. Plant bisexual. Male inflorescence just below the female one; male bracts only slightly saccate at base; antheridium 1. Female bracts deeply 3-4-lobed, ovate, applied to the perianth; the lobes large, narrowly triangular, acute; bracteole rather large, lanceolate or 2-lobed. Perianth clavate to oblong or ovoid, usually united with the bracts toward its base, emergent for most of its length, plicate toward tip, contracted to the mouth; mouth laciniate, the laciniae toothed by projecting cells. Sporophyte unknown. We do not know why the particular specific name. Possibly it has reference to the perianth.—In wet places.

⁵⁵ ē lōng gā' tūs.

ILLUSTRATIONS: None.

EXAMINATIONS: None.

TYPE LOCALITY: On Tronfjell, Alvdal, state of Hedmark, Norway (S. O. Lindberg) June 24, 1882.

RANGE: Greenland (322); Europe (491).

Stephani found no antheridia and therefore considered the plant unisexual; K. Mueller (409) 1:692, 1910, reports the antheridia immediately below the perianth, as does Joergensen (325) 157, 1934. We have some doubt about grouping it under *Orthocaulis*, but with no material at hand are following Buch, Evans and Verdoorn in Revue Bryol. 10(1937) :4, 1938. It is the only bisexual member of the genus in Europe and North America, and likewise the only member which has not a uniformly free perianth. Perhaps the best disposition at present is to leave it where it is until it is better known. The descriptions are meager, the sporophyte unknown, and it has not been illustrated.

2. *Orthocaulis binsteadii*⁵⁶ (Kaal.) Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):294, 1933.

Jungermannia floerkei subspecies *ambigua* Joerg., Christiania Vid. Selsk. Forh. 8:54, 1894.

Jungermannia binsteadii Kaal., Christiania Vid. Selsk. Skrift. 9:9, 1898.

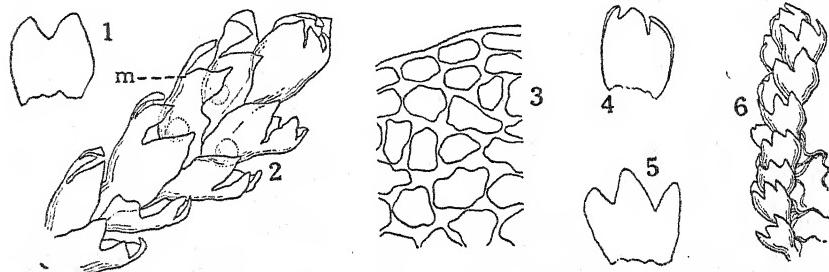
Lophozia binsteadi Evans, Ottawa Naturalist 17:22, 1903.

Jungermannia herjedalica Schiffn. in Arn. Bot. Not. 152, 1906.

Barbilophozia binsteadii Loeske, Hedwigia 49:13, 1909.

Lophozia ambigua Joerg., Bergens Mus. Skrift. 16:138, 1934.

Plants in patches or singly among other bryophytes, yellowish green to rusty red, leafy shoots $\frac{1}{2}$ -1 mm wide. Stems 1-3 cm long, slender, simple or furcately branched. Rhizoids short, present far up the stem. Leaves decidedly succubous, not decurrent, approximate to loosely imbricate, dorsally secund, simply 2-3-lobed, usually 2-lobed, subquadrate, narrowed at base; margins entire except for the terminal lobes; lobes triangular, equal or the ventral rather the larger, bluntly acute to obtuse, incurved



Orthocaulis binsteadii. 1, Usual leaf from middle of sterile shoot, $\times 24$. 2, Male inflorescence with bracts (*m*), and bud at tip, $\times 24$. 3, Cells along leaf margin, $\times 214$. 4-5, Leaves grading into bracts by the female inflorescence, $\times 24$. 6, Part of shoot with young inflorescence, $\times 14$. (All original, by Elizabeth Curtis.)

⁵⁶ bin stēd' i i. Many authors use only one final "i." Kaalaas in the original description used "ii."

toward the stem; sinuses descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, acute. Cells of the leaf middle 22-28 μ , of the apices and margin 18-22 μ ; walls slightly thickened; trigones yellowish, large to bulging into the cells, sometimes making the cell hollow somewhat stellate; cuticle verruculose. Gemmae on the tips of short thick branches with regularly developed leaves, triangular to angularly spherical, 1-celled, reddish brown. Underleaves rarely present on sterile stems. Plants unisexual. Male plants in the same patch with the female ones, slender; male inflorescence terminal or farther down; male bracts small, very convex, with a large tooth at base of dorsal margin; antheridia 1-2, shortly stalked. Female bracts 3-4-lobed, with recurved margins and thus convex adaxially, dentate; the lobes acute to acuminate; bracteole lanceolate, with some teeth. Perianth oblong-ovoid, 2 cells thick toward base, plicate well down from the tip, narrowed and more or less hyaline toward the mouth; mouth lobed and toothed. Seta about 1 cm long. Sporangium spherical, small. Named in honor of C. H. Binstead, who first found it.—In peat bogs, in swamps.

ILLUSTRATIONS: None.

EXAMINATIONS: B. C. Stephens (Brinkman 785) 1913.

TYPE LOCALITY: At Konigsvold on Dovre, Norway (C. H. Binstead) 1893. The town of Dovre is about Lat. $61^{\circ} 33'$ N., Long. $9^{\circ} 12'$ E. The locality is possibly Dovre Field north of the town.

RANGE: Greenland (364), Ellesmere Island (56.01), Pim Island (56.01), District of Keewatin (485.6), N. S. (53.2), Que. (485.6), Alta. (46.2), Yukon (364), Alaska (190), B. C. (46.1); Asia (308.1); Eur. (56.2).

3. *Orthocaulis kunzeanus*⁵⁷ (Hueben.) Buch, Mem. Soc. Fauna Fl. Fennica 8 (1932) :294, 1933.

Jungermannia kunzeana Hueben. Hep. Germ. 115, 1834.

Lophozia floerkei var. *obtusata* Nees Naturg. Eur. Leberm. 2:170, 1836.

Jungermannia plicata Hartm. Skand. Fl., Ed. 3, 2:329, 1838.

Jungermannia colpodes Tayl., London Jour. Bot. 5:280, 1846.

Jungermannia plicata var. *kunzeana* Hartm. Skand. Fl., Ed. 10, 2:137, 1871.

Jungermannia kunzei Lindb. Musci Scand. 7, 1879. Not of Lehm. & Lindenb. in Lehm. Stirp. Pugil. 6:50, 1834.

Jungermannia kunzeana var. *plicata* Lindb. Musci Scand. 8, 1879.

Jungermannia kunzei var. *plicata* Lindb. & Arn., Kgl. Sv. Vet.-Akad. Handl. 23(5):55, 1889.

Lophozia kunzeana Evans, Proc. Washington Acad. Sci. 2:305, 1900.

Jungermannia minuta var. *lignicola* Velenovsky, Jatrovky Ceske 1:6, 1901.

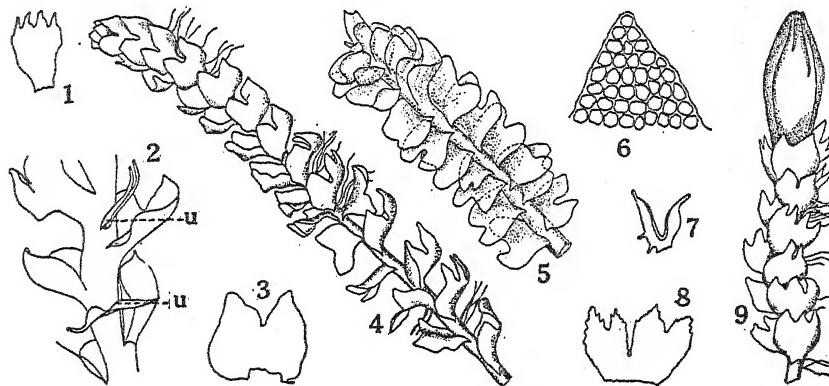
Lophozia colpodes Macoun Cat. Canadian Pls. 7:19, 1902.

Sphenolobus kunzeanus Steph., Bull. Herb. Boissier, Ser. 2, 2:168, 1902; also Sp. Hep. 2:160, 1902.

Plants in tufts or mats, or scattered among other bryophytes, yellowish brown or sometimes green. Stems 2-10 cm long, ascending to erect, rigid, yellowish brown or green, with few branches, often rejuvenating below the perianth; cortical cells elongate, often with very thick walls;

⁵⁷ kün zé á' nüs.

cross section of stem roundish; the cortex of 2-3 layers of cells, smaller than the interior ones; the interior cells thin walled, with or without trigones. Rhizoids numerous, moderately long, colorless. Leaves succubous but almost transversely inserted, slightly to hardly decurrent on the dorsal margin, distant to imbricate, the lower ones horizontally spreading, the upper ones erect-spreading to almost erect, simply 2-lobed or some leaves 3-lobed, subquadrate to subrotund, usually wider than long, averaging about 1 mm long and 1.2 mm wide, about half embracing the stem, concave, margins entire except for the apical teeth, or with a tooth at the ventral base; lobes broadly ovate, about equal, incurved, rounded to obtuse at tip; sinuses descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, acute to narrowly rounded at base, often gibbose. Cells of the leaf middle 18-25 μ , of the leaf tips and margin 12-18 μ , of the base somewhat larger than those of the middle, roundish polygonal; walls thin to slightly thickened; trigones usually small but sometimes moderately large; cuticle striate-verruculose. Gemmae in clusters, from the margin near the tips of the upper leaves and thus making these leaves erose, ovoid to irregularly 3-5-angled,



Orthocaulis kunzeanus. 1, Female bracteole, $\times 10.6$. 2, Part of sterile shoot, ventral view, with underleaves (*u*), $\times 16$. 3, Leaf, $\times 10.6$. 4-5, Sterile shoot, dorsal view, $\times 8.5$. 6, Cells of leaf lobe, $\times 159$. 7, Underleaf, $\times 10.6$. 8, Leaf, dentate through formation of gemmae, $\times 10.6$. 9, Shoot with perianth, $\times 8.5$. (1, 3-4, 6-9, after K. Mueller; 2, after Jensen; 5, after Pearson.)

1-2-celled, 12-18 μ , yellowish green to reddish brown. Underleaves common, variable, from rather small to large, erect-spreading, 2-lobed almost to base; the lobes long, subulate to lanceolate, incurved toward the stem, entire or with 1-3 teeth or cilia near base on one side. Plant unisexual. Male inflorescence terminal; male bracts up to 20, shorter than the leaves, more erect, intricate, saccate at base, the lobes incurved; antheridia 2-3, among paraphyses. Female bracts hardly longer than the leaves beneath them but wider, erect, 3-4-lobed but mostly 4-lobed for $\frac{1}{4}$ - $\frac{1}{3}$ their length;

margin with a tooth or lacinia near base on one or both sides; the lobes ovate, obtuse to acute or apiculate; the sinuses very narrow, gibbose; bracteole large, lanceolate to oblong, nearly always 2-lobed for $\frac{1}{3}$ its length but sometimes entire or 3-4-lobed, spinous dentate at base; the lobes incurved toward the stem, each ending in a large ovate hyaline cell. Perianth oblong-ovoid, about $\frac{3}{4}$ -emergent, several cells thick below, plicate in upper $\frac{1}{4}$, gradually contracted to the mouth; mouth dentate-serrate. Seta about 5 mm long; in cross section all the cells much the same. Sporangium ovoid-elliptic, dark brown to reddish brown, wall 3 cells thick; epidermal cells about thrice as large as the innermost wall cells, with nodular thickenings. Elaters about 10μ thick; spirals 2, closely wound, vinous red. Spores $10-14 \mu$, minutely rough, pellucid, pale reddish. We do not know which Mr. Kunze was honored by this name.—In marshes, at margins of streams, on rocks in wet situations, in rock crevices, among mosses, on rotten wood, in peat bogs.

ILLUSTRATIONS: Pearson (433) 2: pl. 151; K. Mueller (409) 1: fig. 304; Macvicar (374) 204, figs. 1-5; Meylan (386) fig. 103; Warnstorff (523) 192, fig. 5; Haynes, Bryologist 11: pl. 1, figs. 1-3, 1908; Jensen (323.5) 109, 2 figs.

EXAMINATIONS: *Alta.* Altrude Lakes in Banff National Park (Rakestraw) 1937.—*B. C.* Telachuh Lake (Brinkman 502) 1911.

TYPE LOCALITY: "Bruecke vor der Heinrichshoehe nach dem Schneloche," in the Hartz Mts., Germany (Huebener).

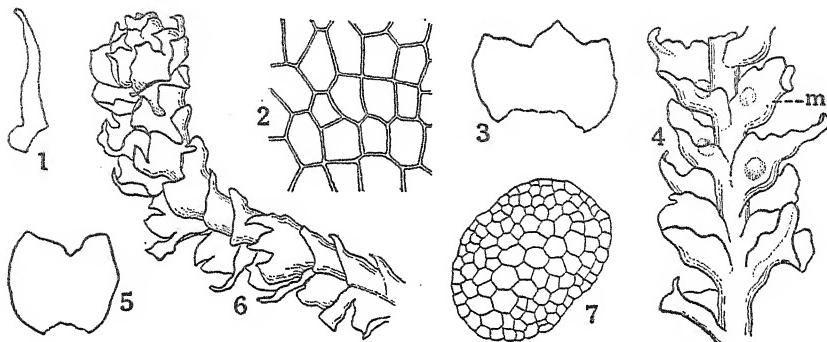
RANGE: Greenland (248), Baffin Island (277.2), N. S. (53.2), Me. (369.1), N. H. (359), N. Y. (262), Que. (178), Ont. (431), Mich. (485.1), Colo. (175), Alta. (373), B. C. (371), Yukon (51); Asia (350); Eur. (409); Spitzbergen (524.3).

4. *Orthocaulis atlanticus*⁵⁸ (Kaal.) Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):294, 1933.

Jungermannia atlantica Kaal., Vid. Skrift. I. Math. Nat. Klasse 1(9):11, 1898.
Lophozia atlantica Schiffn. Lotos 49:46 of reprint, 1901.

Plants in tufts, greenish brown to brown; leafy shoots 1-1.5 mm wide. Stems 1-3 cm long, prostrate to ascending, branched or unbranched, with or without small-leaved innovations from the apex of the stem, flexuous, green or brown. Rhizoids scarce to rather numerous, colorless. Leaves almost transversely inserted, with a tendency toward succubous, shortly decurrent dorsally, distant to imbricate, erect-spreading to spreading, simply 2-4-lobed at tip, usually 3-lobed, from broadly oval when 2-lobed to obovate-quadrata or roundish quadrata when 3-4-lobed, often wider than long, semicylindric through the widely involute margins; margins entire except for the terminal lobes; lobes equal or the ventral one the larger, triangular to ovate, incurved, acute to subacute, their margins with sinuations or rounded teeth; sinuses descending as much as $\frac{1}{3}$ the leaf

⁵⁸ ät län' ti küs.



Orthocaulis atlanticus. 1, Underleaf, x61. 2, Cells of the leaf middle, x241. 3, Leaf, x19. 4, Part of antheridial shoot, with male bract (*m*), x19. 5, Leaf, x19. 6, Sterile shoot, x14. 7, Cross section of stem, x143. (Original, by Elizabeth Curtis, from Verdoorn's Hep. Select. Crit. No. 430.)

length, acute to obtuse, not gibbose. Cells of the leaf middle 18-23 μ , of the tips and margin 16-20 μ , of the base 23-33 μ , roundish polygonal; walls slightly thickened; trigones small to rather large; cuticle striate-verruculose. Gemmae in clusters, at the tips and dorsal margins of the upper leaves, thus often making them erose to ciliate, irregularly and obtusely 3-4-angled, 1-celled or rarely 2-celled, 25-30 by 20-25 μ , vinous red. Underleaves few to wanting, near tips of stems and branches, small, subulate to lanceolate, margins entire or with 1 tooth. Plants unisexual. Otherwise unknown. We do not know why this particular name was selected for it.—On dry soil among rocks; subalpine.

ILLUSTRATIONS: Macvicar (374) 199, figs. 1-4; Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):291, fig. II, 13, 1933.

EXAMINATIONS: None.

TYPE LOCALITY: European.

RANGE: North America (270.1 and 56.55)⁵⁹; Eur. (374 and 409); Iceland (409).

5. *Orthocaulis gracilis*⁶⁰ (Schleich.) Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):294, 1933.

Jungermannia gracilis Schleich. Pl. Crypt. Exsic. Helv., Cent. 3, No. 60, 1804.
Jungermannia barbata var. *minor* Hook. Brit. Jung. pl. 70, figs. 18-20, 1816.
Jungermannia quinque-dentata var. *attenuata* Mart. Fl. Crypt. Erlangensis 177, 1817.

Jungermannia barbata var. *attenuata* Mart. Fl. Crypt. Erlangensis 177, pl. 6, fig. 50c, 1817.

Jungermannia attenuata Lindenb., Nova Acta Acad. Caes. Leop.-Carol. Nat. Cur. 14, Suppl. 48, 1829.

Jungermannia quinquedentata var. *gracilis* Hueben. Hep. Germ. 203, 1834.

⁵⁹ These are the only records of its occurrence in North America of which we know, and the locality is not stated in either.

⁶⁰ grās' i lis.

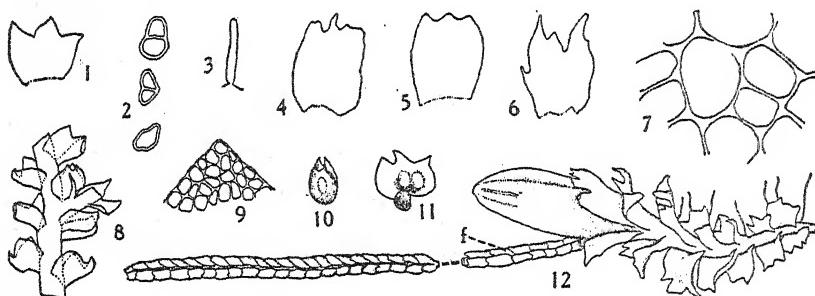
Lophozia attenuata Dum. Rec. d'Obs. 17, 1835.

Lophozia gracilis Steph. Bull. Herb. Boissier, Ser. 2, 2:47, 1902; and Sp. Hep. 2:147, 1902.

Barbilophozia attenuata Loeske, Verh. Bot. Ver. Brandenberg 49:37, 1907.

O. attenuatus Buch, Evans & Verdoorn in Ann. Bryologici 10(1937) :4, 1938.

Plants in tufts, green to brown; normal leafy shoots 1-2 mm wide. Stems 1-4 cm long, prostrate to ascending, simple or branched, with innovations from the tip, flexuous, green to brown; innovations erect, numerous, 10-15 mm long, filiform, almost cylindrical on account of their closely imbricate and appressed leaves. Rhizoids usually numerous except on the innovations, colorless. Leaves of the normal branches succubous but nearly transverse, shortly decurrent dorsally, approximate to imbricate, erect-spreading to spreading, simply 3-lobed or rarely 4-lobed, obovate-quadrangular, 400-500 μ wide and as long or nearly so, concave; margins entire except for the terminal lobes; lobes equal or the ventral the larger, triangular, acute to subacute; sinuses descending $\frac{1}{4}$ - $\frac{1}{2}$ the leaf length, acute to obtuse, not gibbose except near the perianth. Leaves of the inno-



Orthocaulis gracilis. 1, Leaf, x 10.6. 2, Three gemmae, x 222. 3, Underleaf, x 32. 4-5, Leaves of flagelliform branch, x 21. 6, Underleaf of normal shoot, x 21. 7, Cells of the leaf middle, x 339. 8, Branching and leaf subtending the branch, x 16.9. 9, Cells of the leaf tip, x 148. 10-11, Male bracts, x 13.1. 12, Dorsal view of tip with perianth and flagelliform shoot (f), x 10.6. (1-6, 9, 12, after K. Mueller; 7, original, by Elsie K. Waddingham; 8, after Evans; 10-11, after Pearson.)

vations transverse, erect, appressed, 2-4-lobed, oblong to subquadrangular, often gemmiparous and erose at tip. Cells of the leaf middle 15-21 μ , of the margin about 14-16 μ , of the base 20-25 μ long, polygonal to roundish polygonal; walls slightly thickened; trigones small to indistinct; cuticle striate-verruculose. Gemmae at the tips of the leaves of the innovations, sometimes also from the adjacent stems, irregularly angular to pyramidal or ovoid, 2-celled, pale green to yellowish red. Underleaves wanting or rarely present, mostly on the young parts, subulate to lanceolate or 2-lobed. Plants unisexual. Male inflorescence along the middle of the stem; male bracts 10-14 or more, closely imbricate with spreading tip,

3-lobed, very concave, saccate at base, the dorsal margin 1-toothed at base, the sinus often gibbose; antheridia 1-2, ovoid. Female inflorescence terminal; female bracts little larger than the leaves, transversely inserted, embracing the perianth, spreading at tip, unequally 3-5-lobed to about $\frac{1}{2}$ the length; the lobes triangular, acute to cuspidate; the sinuses gibbose; bracteole ovate, free from the bracts, irregularly 2-4-lobed, its lobes acute to cuspidate, somewhat toothed at margin. Perianth oblong to cylindric or clavate, about $\frac{3}{5}$ -emergent, obtusely plicate nearly to middle, acutely narrowed to the mouth; mouth unequally ciliate, the cilia of 6 cells or sometimes fewer. Seta 1-1.5 cm long. Sporangium ovoid, bright reddish brown, its walls 2 cells thick; epidermal cells larger than the inner, with nodular thickenings; inner wall cells with semiannular thickenings. Elaters about 8μ thick; spirals 2, loosely coiled, vinous red. Spores 10-14 μ , rough, vinous red. The name the *L. gracilis*, slender; in reference to the almost cylindrical narrow leafy shoots.—On rotten wood, on banks, on peaty soil, on rocks and walls; in shade; subalpine to alpine.

ILLUSTRATIONS: Pearson (433) 2: pl. 147; Haynes, Bryologist 10: pl. 2, figs. 12-16, 1907; K. Mueller (409) fig. 306; Macvicar (374) 200, figs. 1-5; Gil (76) fig. 229; Warnstorf (523) 209, fig. 5; Hooker (285) pl. 70, figs. 18-21; Evans, Ann. Bot. 26:15, fig. 19, 1912; Martius, Fl. Crypt. Erlangensis pl. 6, fig. 50c, 1817; Jensen (323.5) 117, 2 figs.

EXAMINATIONS: Alaska, St. Paul Island (Kincaid) 1897.—Colo. Longs Peak (Kiener) 1934; Silverton (Frye) 1931.—Mass. Mt. Machuset (Greenwood) 1922.—Mich. Phoenix (Taylor 501) 1928.—Mont. Many Glaciers in Glacier National Park (Frye) 1928.—N. H. White Mts. (Underwood & Cook) 1889, and (Haydock) 1904.—N. Y. Little Moose Lake in Herkimer County (Haynes).—Que. Rigaud (Dupret 21) 1906.—Wyo. Albany County (Porter 1439) 1933; Johnson County (Porter 1637) 1934; Yellowstone National Park (Frye) 1931.

TYPE LOCALITY: European.

RANGE: Greenland (320), Labrador (510), Newfoundland (373), N. S. (53.2), Me. (333), N. H. (354.2), Vt. (244), Mass. (180), Conn. (155), N. Y. (212), Que. (178), Ont. (431), Mich. (88.1), Wis. (98), Minn. (94.1), Mont. (81), Alaska (173), B. C. (412.1), Wash. (81), Wyo. (83), Colo., Pa. (338), N. C. (43); Asia (350); Novaya Zemlya (248.1); Spitzbergen (524.3); Eur. (329); Azores (2.075).

6. *Orthocaulis floerkii*⁶¹ (Web. & Mohr) Buch, Mem. Soc. Fauna Fl. Fennica 8 (1932): 294, 1933.

Jungermannia floerkii Web. & Mohr, Bot. Taschenb. 410, 1807.

Jungermannia naumannii Mart. Fl. Crypt. Erlangensis 143, 1817.

Jungermannia barbata var. *floerkii* Nees Naturg. Eur. Leb. 2:168, 1836.

Jungermannia barbata var. *naumanniana* Nees Naturg. Eur. Leb. 2:170, 1836.

Jungermannia floerkii var. *naumannii* Dum. Hep. Eur. 73, 1874.

Jungermannia lycopodioides var. *floerkei* Lindb. Musci Scand. 7, 1879.

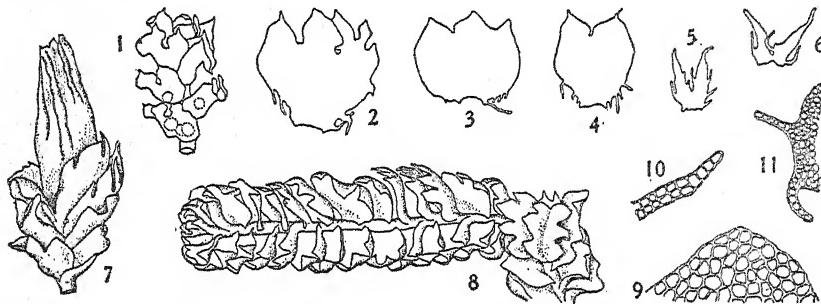
Lophozia floerkii var. *alpina* Pears. List Canadian Hep. 22, 1890.

Lophozia floerkei Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3):85, 1893.

Barbilophozia floerkei Loeske, Verh. Bot. Verh. Brandenburg 49:37, 1907.

⁶¹ fl̄̄r' ki i. The original ending is "ii."

Plants in tufts or sods, pale green to dark green or brownish; leafy shoots 1.3-1.8 mm wide. Stems 3-6 cm or rarely longer, ascending to erect, with few branches, rigid, flexuous, green or brown. Rhizoids numerous, rather short, colorless. Leaves succubous but nearly transverse, shortly decurrent dorsally, imbricate, erect-spreading, simply 3-lobed, quadrate-rotund, symmetric, concave; the two lateral margins about equal in length and curvature, the dorsal entire, the ventral ciliate at base; the cilia 1-4, of cells hardly longer than wide; lobes subequal, the ventral commonly larger than the dorsal one, incurved toward stem, triangular to broadly ovate, acute to obtuse; sinuses descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, gibbose, acute to obtuse. Cells of the leaf middle 20-25 μ long, of the apex and margin 16-20 μ , of the base 24-26 μ , rounded-polygonal; walls thin; trigones small to medium in size; cuticle smooth or verruculose. Gemmae very rare, on the lobes of the upper leaves, oblong to 3-4-angled, usually



Orthocaulis floerkii. 1, Male inflorescence, x 18.7. 2, Female bract, x 10.6. 3, Leaf, x 10.6. 4, Female bracteole, x 10.6. 5, Underleaf, x 10.6. 6, Underleaf, x 12.7. 7, Tip of shoot with perianth, x 6.8. 8, Part of sterile plant, dorsal view, x 6.8. 9, Cells of the leaf tip, x 114. 10, Tip of lobe of underleaf, x 74. 11, Cilia at ventral base of leaf margin, x 51. (1, after Haynes; 2-5, 7-9, 11, after K. Mueller; 6, 10, after Jensen.)

1-celled, greenish white to reddish. Underleaves large, usually 2-lobed, the margins usually with long cilia. Plants unisexual. Male plants intermingled with the female; male inflorescence terminal or farther down the stem; male bracts 8-14 or more, smaller than the leaves, imbricate, transversely inserted, shortly 3-lobed, concave, saccate at base, one or both margins with a tooth at base; antheridia 1-3; ovoid-globose, with a short stalk, among paraphyses. Female inflorescence terminal; female bracts erect, embracing the perianth, plicate above, crispate, 3-7-lobed; the lobes short, variable, obtuse or cuspidate, both margins with cilia-like teeth; bracteole wide, 2-lobed to about $\frac{1}{3}$, quadratic in general outline, more or less ciliate on both margins, the apical lobes terminating in a cilia-like tooth. Perianth nearly cylindric to spindle-shaped, plicate in the upper half, very gradually narrowed at apex; mouth wide, shortly ciliate, the

cilia 1 cell long. Seta long. Sporangium ovoid-globose, dark brown, its wall of 4 layers of cells all of which have semiannular thickenings; epidermal cells very large; the inner layers of much smaller cells. Elaters about 8 μ thick; spirals 2, reddish brown. Spores about 12 μ , smooth. Probably named in honor of Prof. H. G. Floerke of Rostock, Germany, whose interest was chiefly in lichens.—On banks among rocks, on rocks; subalpine to alpine.

ILLUSTRATIONS: Pearson (433) 2: pl. 150; K. Mueller (409) 1: fig. 302; Macvicar (374) 197, figs. 1-4; Gil (76) fig. 230; Haynes, Bryologist 10: pl. 2, figs. 1-4, 1907; Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):291, fig. II, 11, 1933; Jensen (323.5) 117, 3 figs.

EXAMINATIONS: B. C. Kicking Horse Lake (Macoun 991) 1885.—Mont. Glacier National Park (Miller) 1934.—N. Mex. Gila National Forest (Rakestraw) 1938.—Wash. Elwha River valley in Olympic Mts. (Frye) 1907; Guemes Island (Frye) 1905; Lake Keechelus (Frye) 1921.

TYPE LOCALITY: European.

RANGE: Ellesmere Isl. (56.01), Greenland (336.2), Labrador (373), Vt. (241), N. H. (140), Que. (178), Colo. (175), Mont. (81), Alta. (51), Yukon (298), Alaska (173), B. C. (371), Wash. (81), N. Mex.; Asia (350); Spitzbergen (524.3); Iceland (409); Eur. (458); Azores (491); South Georgia (409); Antarctica (409).

7. *Orthocaulis quadrilobus*⁶² (Lindb.) Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):294, 1933.

Jungermannia quadriloba Lindb., Medd. Soc. Fauna Fl. Fennica 9:162, 1883.

Lophozia quadriloba Evans, Proc. Washington Acad. Sci. 2:304, 1900.

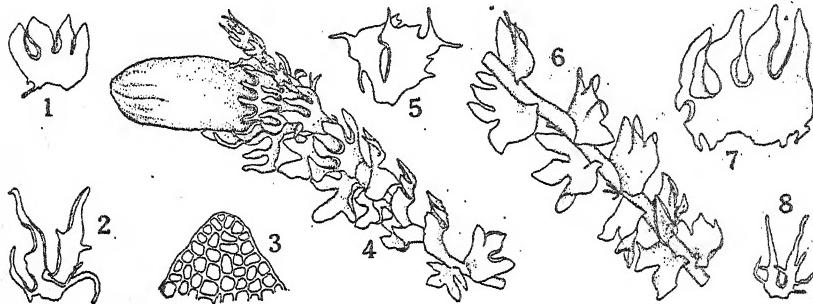
Sphenolobus quadrilobus Steph., Bull. Herb. Boissier, Ser. 2, 2:176, 1902; also Sp. Hep. 2:168, 1902.

Lophozia quadriloba var. *heterophylla* Bryhn & Kaal., Rept. 2nd Norwegian Arctic Exped. in "Fram" in 1898-1902, 11:39, 1906.

Plants solitary among mosses, or in tufts or mats, slender, mostly olive green to brownish green or almost black, the leafy branches terete. Stem 3-4 cm long, erect to ascending, unbranched or furcate, sometimes rejuvenating beneath the perianth. Rhizoids numerous, short. Leaves succubous to nearly transversely inserted, dorsally shortly or hardly decurrent, distant, or near the female tips loosely imbricate, erect-spreading to somewhat horizontally spreading, simply 2-4-lobed, broadly obtuse to transversely elliptic, half-clasping the stem, concave; dorsal margin entire or with 1-3 cilia-like teeth toward base, ventral margin with 1-2 cilia-like teeth near base; the teeth long, narrow, of cells little longer than wide, sometimes 2 cells wide at base; lobes equal or the ventral slightly larger, oblong to triangular-ovate, acute to subacute or somewhat obtuse, often incurved, their margins often revolute; sinuses descending $\frac{1}{2}$ - $\frac{2}{3}$ the leaf length, narrowly roundish or acute, strongly gibbose, often with revolute margin. Cells of the leaf middle 20-25 μ , of the margin 15-18 μ , roundish;

⁶² kwād rī 16' būs.

walls thin; trigones small to large; cuticle coarsely verruculose. Gemmae rare, on the tips of the upper leaves, various in form, mostly rhomboidal, sometimes triangular or ovoid, 2-celled, 18-27 μ , thick walled, yellowish. Underleaves always present, large, 2-lobed almost to base, the lobes narrowly lanceolate and almost filiform toward tip; the leaf margins with 1-3 cilia near base; the cilia 1-2 cells wide at base, curved. Plants unisexual. Male inflorescence terminal; male bracts 20-40, closely imbricate, saccate or keeled, mostly 3-4-lobed to about $\frac{1}{3}$ the bract length; the lobes obtuse,



Orthocaulis quadrilobus. 1, Leaf, x 13.2. 2, Female bracteole, x 21. 3, Cells of the leaf tip, x 95. 4, Shoot with perianth, x 13.2. 5, Female bracteole, x 21. 6, Part of sterile shoot, dorsal view, x 13.2. 7, Female bract, x 21. 8, Underleaf, x 21. (All after K. Mueller.)

more incurved than the leaves; antheridia 2-3, large, ovoid, shortly stalked, among paraphyses. Female bracts as large or slightly larger than the leaves, erect-spreading, 4-5-lobed to about $\frac{1}{2}$ the bract length, with large irregular teeth toward basal margins; the lobes acute to blunt, narrow, with recurved margins. Perianth oblong-ovoid, about $\frac{4}{5}$ -emergent, plicate in the upper $\frac{1}{4}$, obtusely contracted to the mouth; mouth irregularly and shortly dentate; teeth serrate, incurved. Mature sporophyte unknown. So named because the leaves are commonly 4-lobed.—On rocks and humus; in high altitudes.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 303; Macvicar (374) 203, figs. 1-4; Meylan (386) fig. 99, a-c; Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):291, fig. 2 (12), 1933.

EXAMINATIONS: Alta. Near Peyt Glacier (Rakestraw) 1937.—B. C. Stephens (Brinkman 785) 1913.

TYPE LOCALITY: European.

RANGE: Greenland (248), Ellesmere Isl. (56.01), Pim Isl. (56.01), North Kent Isl. (56.01), Southampton Isl. in Hudson Bay (485.6), Alaska (135), B. C. (247.1), Alta. (46.2); Asia (350); Novaya Zemlya (325); Eur. (329); Spitzbergen (409).

*TEMNOMA*⁶³ Mitt., Hooker's Handbook New Zealand Flora 2:753, 1867.

Blepharostoma subgenus *Temnoma* Mitt., Jour. Linn. Soc. 8:53, 1864.
Chandonanthus Mitt., Hook. Handb. New Zealand Fl. 2:750, 1867.

Plants in mats, usually large and rigid, yellowish to blackish brown. Stems with few or no branches, rigid; branches lateral; 1 innovation below the perianth. Leaves nearly transversely inserted or somewhat succubous, imbricate, simply 3-4-lobed or rarely 2-lobed, half-clasping the stem; margin dentate or at base spinous-dentate; lobes entire to variously dentate; sinuses descending to near base of leaf. Cells of leaves 18-23 μ ; walls considerably thickened; trigones rather large but indistinct. Gemmae unknown. Underleaves resembling the leaves, rather smaller, 2-lobed to near base, their margins coarsely toothed to ciliate. Plants unisexual. Male plants rarely found; male inflorescence along the stem, resembling a part of a sterile shoot; male bracts with sinus somewhat deeper than the leaves; antheridia 2-3; paraphyses present. Female inflorescence terminal on normal shoot; female bracts larger than the leaves, more dentate. Perianth $\frac{1}{3}$ - $\frac{1}{2}$ -emergent, deeply 7-8-plicate almost to base, 1 cell thick, slightly contracted to mouth; mouth rather large, ciliate or dentate. Calyptra thin, free, with sterile archegonia around its base. Name from Gk. *temnein*, to cut; from the deeply cleft leaves.

Leaves with several large teeth at the base on each margin, the teeth often ending in a cilium; sinus $\frac{3}{4}$ - $\frac{5}{6}$ the leaf length.... 1. *T. setiforme*.

Leaves with one or no marginal tooth at each base, the tooth when present not ending in a cilium; sinus $\frac{2}{3}$ - $\frac{3}{4}$ the leaf length.... 1a. var. *alpinum*.

1. *Temnoma setiforme*⁶⁴ (Ehrh.) Howe, Bull. N. Y. Bot. Gard. 2:104, 1901.

Jungermannia setiformis Ehrh. Beitr. 3:80, 1788.

Jungermannia concatenata Sm. in Linn. Fl. Lapp. 343, 1792.

Anthelia setiforme Dum. Rec. d'Obs. 18, 1835.

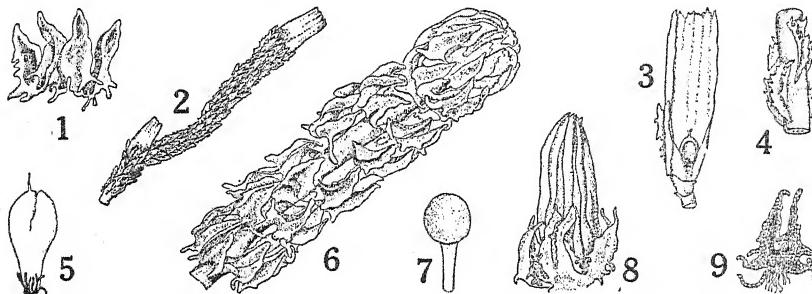
Chandonanthus setiformis Mitt., in Hooker Handb. N. Zealand Fl. 2:750, 1867.

Blepharostoma setiforme Lindb. & Arn., Kgl. Sv. Vet.-Akad. Handl. 23(5):28, 1889.

Plants in compact tufts or patches, sometimes scattered among mosses, reddish yellow to brownish yellow; the leafy shoots almost terete, 500-750 μ wide. Stems 2-6 cm long, procumbent to erect, filiform, rigid and brittle when dry; branches lateral, few, short to long, erect, sometimes attenuate and microphyllous at tip; usually with a single innovation beneath the perianth. Rhizoids few, short, almost confined to base of stem and to apex of microphyllous branches, colorless. Leaves succubous but almost transversely inserted, not decurrent, approximate to imbricate, almost erect from a spreading base, simply 3-4-lobed, reniform in general outline, wider than long, about half-embracing the stem, margins of leaves

⁶³ tēm' nō mā.
⁶⁴ sē tǐ fōr' mě.

coarsely dentate at base and on lower part of lobes; their teeth commonly reflexed, unequal; lobes oblong-lanceolate, erect, subacute, their margins recurved; sinuses descending $\frac{3}{4}$ - $\frac{5}{6}$ the leaf length, acute to rounded. Cells of the leaf middle 18-23 μ , of the tips and base about the same, roundish or oval; wall thickish; trigones present, rather indistinct; cuticle slightly granulate, thick. Underleaves present throughout, resembling the



Tenma setiforme. 1, Leaf, x 17.6. 2, Part of plant with perianths, x about 4. 3, Perianth with part cut off, with calyptra and young sporophyte within, x about 12. 4, Part of leafy shoot, x about 15. 5, Calyptra, with unfertilized archegonia at base, x about 25. 6, Upper part of a leafy shoot, x 17.6. 7, Sporangium, x about 7. 8, Perianth, x 10.6. 9, Underleaf, x 17.6.
(1, 6-9, after K. Mueller; the others after Hooker.)

leaves, large but narrower than the leaves, usually deeply 2-lobed, coarsely dentate to ciliate-dentate especially at base. Plants unisexual. Male plants rare; male inflorescence about the middle of the stem; male bracts very like the leaves, concave at base adaxially, less deeply divided; antheridia 2-3, large, among paraphyses. Female inflorescence terminal; female bracts free from the perianth, resembling the leaves, larger, less deeply lobed, spinose-ciliate at basal margins; the lobes lanceolate, longly acuminate, coarsely dentate at base; bracteole free from the bracts, 2-lobed to the middle, laciniate-ciliate at base; the lobes triangular-lanceolate; longly acuminate, dentate-ciliate at base. Perianth $\frac{1}{3}$ - $\frac{1}{2}$ -emergent, oblong, of 1 layer of cells, 7-10-plicate to base, acutely contracted to the mouth; mouth shortly 2-lobed, ciliate; the cilia 3-6 cells long, with occasionally a few 1-celled teeth between them. Sporangium ovoid, reddish brown. Elaters 8-9 μ thick. Spores 13-15 μ , reddish brown. The name from L. *seta*, hair or bristle, and *forma*, form; in reference to the tendency of leaves, underleaves and female bracts to have hair-like projections on the margins at base.—On rather dry granite rocks; alpine and subalpine.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 93; Pearson (433) 2: pl. 42; Macvicar (374) 342, figs. 1-4; Meylan (386) fig. 171; Hooker (285) pl. 20, figs. 2-3, 6-14; Ekart (124) pl. 2, fig. 15.

EXAMINATIONS: N. H. Mt. Lafayette (Evans) 1908; Mt. Washington (Underwood & Cook) 1889.

TYPE LOCALITY: "Auf dem Brocken" (probably an elevation) in the Hartz Mts., Germany (Ehrhart). (In the general vicinity of Lat. $51^{\circ} 40'$ N., Long. $10^{\circ} 30'$ E.)

RANGE: Greenland (504), Ellesmere Isl. (409), Arctic Amer. Archipelago (248.1), Southampton Isl. in Hudson Bay (485.6), Arctic Amer. Mainland (248.1), Yukon (298), Alaska (173), B. C. (341), Que. (431), Vt. (169), N. H. (359), Me. (333), Labrador (510); Asia (248.1); Novaya Zemlya (319.5); Eur. (351.5); Spitzbergen (409); Iceland (248.1).

The sporophyte needs detailed study. Not enough is known of its structure to make it valuable as evidence of relationship.

1a. *Temnoma setiforme* var. *alpinum*⁶⁵ (Hook.) n. comb.

Jungermannia setiformis var. *alpina* Hook. Brit. Jung. pl. 20, figs. 1, 3-4, 1816.

Jungermannia filum Dum. Syll. Jung. Eur. 64, 1831.

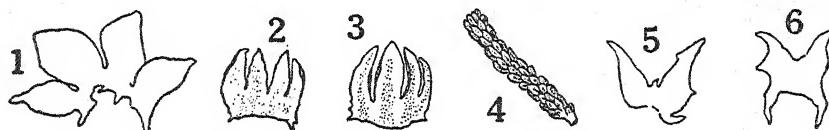
Anthelia filum Dum. Hep. Eur. 98, 1874.

Blepharostoma subintegrum Lindb., Jour. Bot. 25:195, 1887.

Blepharostoma filum Lindb. & Arn., Kgl. Sv. Vet.-Akad. Handl. 23(5):28, 1889.

Chandonanthus setiformis var. *alpina* Kaal., Nyt. Mag. Naturvid. 33:227, 1893.

Plants in tufts. Stems usually prostrate to more rarely erect. Leaves smaller than in the type, simply 3-4-lobed; lateral margins with 0-1 tooth near base; lobes ovate, usually only the middle ones keeled; sinuses descending about $\frac{3}{4}$ the leaf length. Cells of the leaf middle 18-20 μ , roundish; walls slightly thickened in the angles; cuticle almost smooth. So named from its mountain habitat.—On granitic rocks; alpine or in the far north.



Temnoma setiforme var. *alpinum*. 1, Leaf, x 35. 2-3, Leaves, x about 26. 4, Part of a leafy shoot, x about 26. 5-6, Underleaves, x 35. (1, 5-6, after Meylan; 2-4, after Hooker.)

ILLUSTRATIONS: Hooker (285) pl. 20, figs. 1, 4-5.

EXAMINATIONS: None.

TYPE LOCALITY: Perhaps the summit of Cairn-Gorum, Scotland, may be considered the type locality.

RANGE: Greenland (248.1); Eur. (285).

The variety probably is only a form due to difficult conditions, but until more is known about it in comparison with the type it is perhaps better to keep it separate. Schiffner (Lotos 60:47-48, 1912) thinks it would be better to consider two varieties based upon the tips of the lobes, and upon the margin, respectively; var. *obtusiloba* Schiffn. and var. *subintegerrima* Schiffn. In that case the American material falls to var. *subintegerrima*.

⁶⁵ āl pīn' ūm.

TRITOMARIA⁶⁶ Schiffn., Ber. Naturw. Ver. Innsbruck 31:(12), 1908.

Sphenolobus subgenus *Tritomaria* K. Muell., Rabenh. Krypt.-Fl. 6(1):606, 1910, in large part.

Jungermannia section *Exsectae* Jensen Danmarks Mosser, Bryofyter 1, 105, 1915, in part.

Jungermannia subgenus *Tritomaria* Arn., Arkiv. f. Bot. 19(10):15, 1925, in part.

Stems prostrate to ascending or rarely nearly erect, distinctly dorsiventrally compressed, the epidermal cells rather more than twice as long as wide. Rhizoids few to numerous. Leaves succubous, not or hardly decurrent dorsally, erect-spreading to spreading, 2-4-lobed but nearly all of them 3-lobed, on sterile plants sometimes quite unsymmetric; insertion strongly succubous anteriorly, transverse posteriorly; margins entire except for the terminal lobes or rarely subsinuate; ventral margin arcuate, distinctly longer than the dorsal one; neither, either or both halves of the leaf 2-lobed but almost always only the ventral half; all the lobes triangular, but gemmiparous lobes usually narrower than those not bearing gemmae, ventral and middle lobes nearly always part of the ventral half of the leaf, the leaf thus 3-lobed, the ventral and middle lobes together more than twice as wide as the dorsal lobe and the distance greater from their tips to the leaf base; the more dorsal sinus deeper than the more ventral one. Cells of the leaf middle 10-30 μ ; walls thin to slightly thickened; trigones wanting to bulging. Gemmae on tips of upper leaves, 1-2-celled. Underleaves usually wanting but rarely present near the female bracts. Plants unisexual; both inflorescences terminal on unmodified shoots. Female bracts nearly symmetric, often 4-lobed. Perianth plicate in upper $\frac{1}{2}$ or less, its mouth lobed to dentate or ciliate. The name from Gk. *tritomos*, thrice cut, cut into 3; in reference to the 3-lobed leaves of some species.

- A. Cells of the leaf middle 10-17 μ , trigones wanting or small, cell-hollow polygonal; gemmae elliptic..... 1. *T. exsecta*.
- AA. Cells of the leaf middle 17-30 μ , trigones large, sometimes even bulging, cell-hollow roundish; gemmae mostly 3-5-angled.
- B. Dorsal margin of leaves but little shorter than the ventral one; leaf lobes somewhat equal; trigones usually bulging.
- BB. Dorsal margin of leaves much shorter than the ventral ones; leaf lobes unequal, the ventral one the largest; trigones not or hardly bulging.
- C. Leaves with dorsal margin and its lobe directed anteriorly; perianth widest above its middle, its mouth ciliate.... 2. *T. exsectiformis*.
- CC. Leaves with dorsal margin and its lobe directed posteriorly; perianth widest below its middle, its mouth dentate..... 3. *T. scitula*.
- 4. *T. quinquedentata*.

⁶⁶ tri tō mā' ri ä.

1. *Tritomaria exsecta*⁶⁷ (Schmid.) Schiffn., according to Loeske, *Hedwigia* 49:13, 1909-1910.

Jungermannia exsecta Schmidel Icon. Pl., Ed. 2, 241, 1797. Not of Hook. Brit. Jung. pl. 19, 1816.

Jungermannia donniana Hueben. Hep. Germ. 116, 1834, except synonymy. Not of Hook. Brit. Jung. pl. 39, 1816.

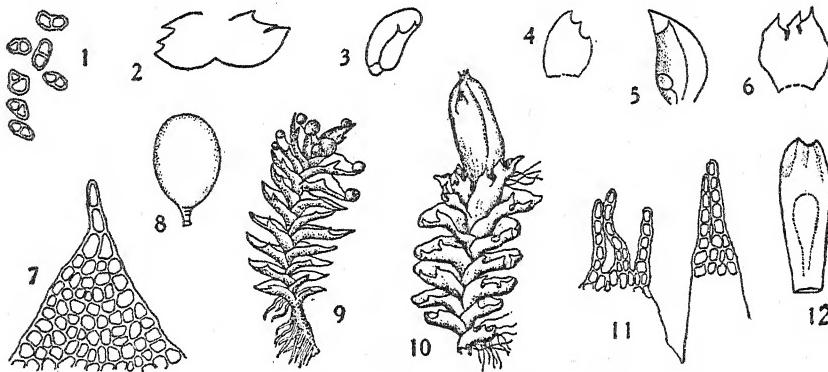
Lophosia exsecta Dum. Rec. d'Obs. 17, 1835.

Scapania exsecta Aust. Hep. Bor.-Amer. Exsic. No. 21, 1873.

Sphenolobus exsectus Steph., Bull. Herb. Boissier, Ser. 2, 2:178, 1902; also Sp. Hep. 2:170, 1902.

Diplophyllum exsectum Warnst. Krypt.-Fl. Mark Brandenburg 1:160, 1902.

Plants scattered among mosses or in small depressed patches, yellowish green to light brown; leafy shoots 1-1.5 mm wide. Stems 0.5-3 cm long, prostrate to ascending or rarely erect, with tip bent forward, reddish brown to nearly black beneath, green above, more or less branched, innovating below the female inflorescence. Rhizoids numerous, colorless to brownish, long. Leaves succubous, not decurrent, distant to subimbricate, rather widely spreading, the dorsal margin almost secund, ovate-lanceolate to ovate, quite convex dorsally to almost semicylindric, not keeled, nearly all unequally and simply 2-lobed, the ventral lobe much the larger



Tritomaria exsecta. 1, Seven gemmae, x 212. 2-3, Leaves, x 8.5. 4, Leaf, x 8.8. 5, Male bract, x 17. 6, Female bract, x 8.8. 7, Cells of leaf tip, x 212. 8, Antheridium, x 60. 9, Gemmiparous plant, x about 10. 10, Plant with perianth, x 8.8. 11, Part of mouth of perianth, x 212. 12, Perianth, x 8.5. (1, 4, 6-7, 10-11, after K. Mueller; 2-3, 5, 8, 12, after Pearson; 9, after Hooker.)

and mostly again bilobed, making the leaf unequally 3-lobed; dorsal lobe commonly about half way between base and apex; middle lobe inserted commonly somewhat back of the tip along the dorsal margin; ventral lobe the apparent tip of the leaf; all the lobes acute to acuminate; margins entire except for the 3 lobes, both arched but the ventral one much more so. Cells of the leaf middle 10-17 μ , of the margin 8-17 μ , rounded-poly-

⁶⁷ ēx sĕk' tă.

gonal, usually 2-4 of the apical cells about twice as large as the adjacent ones; walls somewhat thick; trigones not or hardly present; cuticle minutely verruculose. Gemmae at the tips of the leaf lobes, clustered, elliptic, 11-17 μ long, 8-11 μ wide, 2-celled, reddish to yellowish. Underleaves wanting. Plants unisexual; both inflorescences terminal. Male plants in separate tufts, longer and more slender, often with gemmae at tip; male bracts not numerous, imbricate, saccate at base, 3-lobed, the dorsal lobe incurved; antheridia 1-2; paraphyses wanting. Female bracts about equal to or a little smaller than the leaves, the upper loosely enveloping the base of the perianth, broadly ovate to rounded-quadrata, 3-5-lobed; their lobes acute to acuminate, entire to dentate; their sinuses descending about $\frac{1}{4}$ the bract length; bracteole wanting. Perianth cylindric or slightly obovoid, 4-6-plicate toward tip, gradually contracted to the mouth; mouth narrow, not tubular, somewhat decolorate, unequally spinose-ciliate to spinose-dentate. Seta about 5 mm long. Sporangium ovoid, reddish brown, its wall of 3 layers of cells; epidermal cells large, with nodular thickenings; both inner layers of cells with angular thickenings. Elaters about 8 μ thick; spirals 2, loosely wound, reddish brown. Spores 9-12 μ , papillose, dark brown. Name from L. *exsectus*, cut out; in reference to the lobed leaves.

—In shade, on rotting wood and on rocks; subalpine.

ILLUSTRATIONS: Pearson,⁶⁸ List of Canadian Hepaticae, Geol. Nat. Hist. Survey Canada, pl. 12, 1890; Pearson (433) 2: pl. 145; K. Mueller (409) 1: fig. 294; Ekart (124) pl. 5, fig. 37; pl. 11, fig. 37; Macvicar (374) 216, figs. 1-4; Meylan (386) figs. 92 a-d, 93; Warnstorf (523) 165, fig. 5; Gil (76) fig. 225; Martius, Fl. Crypt. Erlangensis, pl. 5, fig. 38, 1817; Ammons (3.1) 142, fig. A.

EXAMINATIONS: Alaska. Mitrofania Bay (Rigg 1219) 1913.—Iowa. Girard in Clayton County (Sargent & Conard 9, 35) 1939.

TYPE LOCALITY: Bavaria, Germany (Schmidt).

RANGE: Anticosti Isl. (431), N. S. (413), N. B. (369), Me. (369.1), N. H. (140), Vt. (141), Mass. (142), Conn. (212), N. Y. (258), Que. (178), Ont. (373), Mich. (483), Wis. (98), Minn. (94.1), Iowa, Colo. (81), Alta. (373), Alaska (173), B. C. (51), Wash. (431), Tenn. (40.5), N. C. (243), Va. (474.5), Ky. (218), W. Va. (3.1); Mex. (224); Asia (491); Eur. (409).

2. *Tritomaria exsectiformis*⁶⁹ (Breidl.) Schiffn., according to Loeske, Hedwigia 49:13, 1909-1910.

Jungermannia exsecta Hook. Brit. Jung. pl. 19, 1816. Not of Schmid. Icon. Pl., Ed. 2, 241, 1797.

Jungermannia exsectaeformis Breidl., Mitt. Naturw. Ver. Steiermark 30:321, 1893.

Sphenolobus exsectiformis Steph., Bull. Herb. Boissier, Ser. 2, 2:178, 1902; also Sp. Hep. 2:170, 1902.

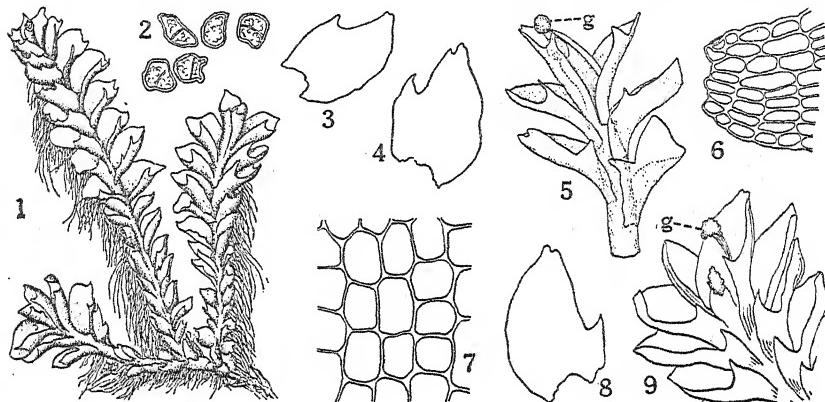
Diplophyllum exsectiforme Warnst. Krypt.-Fl. Mark Brandenburg 1:161, 1902.

Lophozia exsectiformis Boulay Musc. France 2:92, 1904.

⁶⁸ There is a good deal of question about Hooker's (285) plate 19, and about Pearson's (431) plate 12 as well. The figures do not show the characteristics which separate *T. exsecta*, *T. exsectiformis* and *T. scutula*.

⁶⁹ "Ex sek ti form' is. Both Breidler and Stephani spelled it "exsectaeformis"; K. Mueller (409) says it should be "exsectiformis." The latter is now common usage.

Plants scattered among mosses or in patches, yellowish green to light brown, from quite small to vigorous. Stems 0.5-3 cm long, green above, brown to nearly black beneath. Rhizoids numerous, colorless to brownish, long. Leaves succubous, not decurrent, contiguous to imbricate, erect-spreading to spreading, ovate, simply and unequally 2-lobed with the ventral one larger and often again 2-lobed thus making the leaf unequally 3-lobed; margins entire except for the 2-3 lobes; lobes blunt or acute to apiculate, unequal, the most dorsal nearly at the middle of the dorsal margin of the leaf as a whole, the middle one mostly smaller than the



Tritomaria exsectiformis. 1, Plant, dorsal view, x 9.5. 2, Five gemmae, x 286. 3-4, Leaves, x 17. 5, Tip of shoot, dorsal view, with gemmae (g), x 26. 6, Tip of leaf which bore gemmae, x 93. 7, Cells of the leaf middle, x 237. 8, Leaf, x 17. 9, Tip of shoot, dorsal view, with gemmae (g), x 31. (1-2, after K. Mueller; 3-4, 7-9, original, by Elizabeth Curtis; 5, after Buch; 6, after Jensen.)

ventral one but occasionally both small or the leaf only 2-lobed. Cells of the leaf middle 20-30 μ , of the margin 18-22 μ , of the lobes 20-40 μ long, rectangular in the lobes, roundish polygonal in the median region; walls rather thick but not uniformly so, trigones large, not or hardly bulging into the cells. Gemmae formed on the upper leaf tips, in tufts, irregularly and obtusely 3-4-angled or some pyriform, 2-celled, 17-26 μ long, 14-20 μ wide. Underleaves wanting. Plants unisexual; both inflorescences terminal. Male bracts imbricate, saccate at base, the dorsal lobe incurved; antheridia 2. Female bracts broadly oval to almost circular, 3-lobed, the most ventral one sometimes somewhat toothed; bracteole wanting. Perianth free from the bracts, broadly ovoid, obtusely 5-6-plicate near tip, contracted at mouth; mouth lobed and denticulate with teeth 2-3 cells long. Sporophyte unknown. So named on account of its resemblance to *T. exsecta*.—On rotting wood, on soil of banks; subalpine.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 295; Macvicar (374), 218, figs. 1-4; Hooker (285) pl. 19, as *J. exsecta*; Buch, Mem. Soc. Fauna Fl. Fennica 8:285, fig. I, 35, 1932.

EXAMINATIONS: B. C. Shuswap Lake (Brinkman 7219) 1908.—Colo. Rock Springs Pass (Rakestraw) 1938.—Ida. Miller Creek (Rakestraw) 1937.—Mont. Glacier National Park (Frye) 1934.

TYPE LOCALITY: Holt and Edgefield Heaths, England (Rev. R. B. Francis).

RANGE: N. S. (53), Me. (369.1), N. H. (140), Vt. (241), Conn. (185), N. Y. (258), Que. (178), Mich. (94.1), Wis. (98), Colo. (175), Mont. (84.2), Alta. (46.2), B. C. (247.1), Ida. N. C. (10); Eur. (325); Caucasus Mts. (409).

3. *Tritomaria scitula*⁷⁰ (Tayl.) Joerg., Bergens Mus. Aarbok, Naturv. 7:3, 1919-1920.

Jungermannia scitula Tayl., London Jour. Bot. 5:274, 1846.

Sphenolobus scitulus Steph., Bull. Herb. Boissier, Scr. 2, 2:176, 1902; also Sp. Hep. 2:168, 1902.

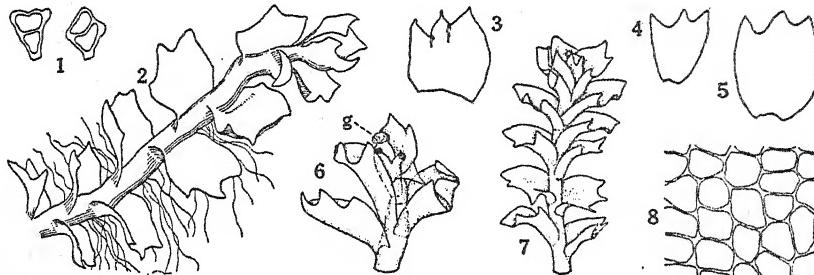
Lophozia exsecta var. *scitula*⁷¹ Pears., Macoun Cat. Canadian Pls. 7:23, 1902.

Diplophylla exsectaeformis var. *aequiloba* Cul., Revue Bryol. 32:73, 1905.

Sphenolobus politus var. *acuta* Schiffn., Oesterr. Bot. Zeitschr. 58: 1908, according to Joergensen (325).

Sphenolobus exsectiformis var. *aequiloba* K. Muell., Rabenh. Krypt.-Fl. 6(1): 611, 1910.

Plants in depressed patches, dull green to brownish. Stems prostrate with ascending tips, branched but often long distances between branches, purplish brown, about 300 μ thick. Rhizoids numerous on prostrate stems,



Tritomaria scitula. 1, Two gemmae, x 254. 2, Shoot, dorsal view, x 20. 3, Female bract, x 10.6. 4-5, Leaves, x 20. 6, Tip of shoot, dorsal view, with gemmae (g), x 10.6. 7, Shoot, dorsal view, x 10.6. 8, Median leaf cells, x 260. (1, 3, 7, after Evans; 6, after Buch; 2, 4-5, 8, original by Elizabeth Curtis.)

few or none on ascending parts. Leaves succubous but the dorsal part transversely inserted, not decurrent, rather distant to slightly imbricate, obliquely spreading, simply 2-lobed with the ventral one much larger and again bilobed with the resulting 3 lobes subequal, long-quadrangular, about 1 mm long and 900 μ wide; apex broad, in general rounded to truncate;

⁷⁰ sit' ü lä.

⁷¹ This is evidently an error in spelling.

margin entire or merely subsinuate except for the 3 terminal lobes; lobes acute to obtuse; sinuses descending about $\frac{1}{4}$ the leaf length, rounded to crescentic. Cells of the leaf middle averaging about 23-30 μ , of the margin 17-25 μ , of the base 30-42 μ ; walls somewhat thick; trigones large, occasionally confluent, usually bulging into the cells; cuticle smooth. Gemmae very common, borne on the leaves of the stem tips, in clusters on the tips of the leaf lobes, 3-5-angular, often irregular in form, often longer than wide, usually 2-celled, 20-25 μ long, golden brown, with slightly thickened walls. Underleaves wanting. Plants unisexual. Male inflorescence terminal or later through proliferation apparently lower down; male bracts much like the leaves, saccate at base, the dorsal lobe shorter than the other two and suberect. Female inflorescence terminal; female bracts crowded, somewhat larger than the leaves, about 1.3 mm long and 1.2 mm wide; the lobes acuminate to cuspidate, the ventral one rather smaller than the other two; the sinuses acute; bracteoles wanting. Perianth cylindric, about 3 mm long and 1 mm thick, sometimes slightly swollen below the middle, toward tip with 4-5 rounded plicae, not markedly contracted at tip; mouth irregularly and not deeply cleft, the lobes more or less toothed; teeth mostly very short but a few 2-3 cells long. Sporophyte unknown. Name from L. *scitus*, sharp; perhaps in reference to the acute lobes and sinuses of the female bracts.—On soil.

ILLUSTRATIONS: Culman, Revue Bryol. 32:74, figs. 1-8,⁷² 1905; Evans, Bryologist 15: pl. 2, figs. 1-5, 1912; K. Mueller (409) 1: fig. 296; Buch, Mem. Soc. Fauna Fl. Fennica 8:285, fig. I, 32-34, 1932.

EXAMINATIONS: B. C. Spences Bridge (Brinkman 249) 1910.

TYPE LOCALITY: North America (Drummond). Very likely in the Rocky Mts. or westward.

RANGE: N. B. (373), Que. (178), Ont. (373), Wis. (98), Minn. (97.2), Alta. (46.2), B. C. (167); Jan Mayen Isl. (325); Eur. (325).

Brinkman's specimens from British Columbia, referred to this by Evans (167), were both from quite west of the Continental Divide. One from "Cougas" Lake, which we believe to be Cougar Lake, is from the vicinity of Lat. 50° 10' N., Long. 120° 25' W. The other is from Tetachuck Lake, about Lat. 53° 15' N., Long. 125° 15' W.

4. *Tritomaria quinquedentata*⁷³ (Huds.) Buch, Mem. Soc. Fauna Fl. Fennica 8 (1932) :290, 1933.

Jungermannia quinquedentata Huds. Fl. Angl. 511, 1762.

Jungermannia barbata var. *quinquedentata* Nees Naturg. Eur. Leberm. 2:196, 1836.

Jungermannia lyoni Tayl., Trans. Bot. Soc. Edinburgh 1:116, 1844.

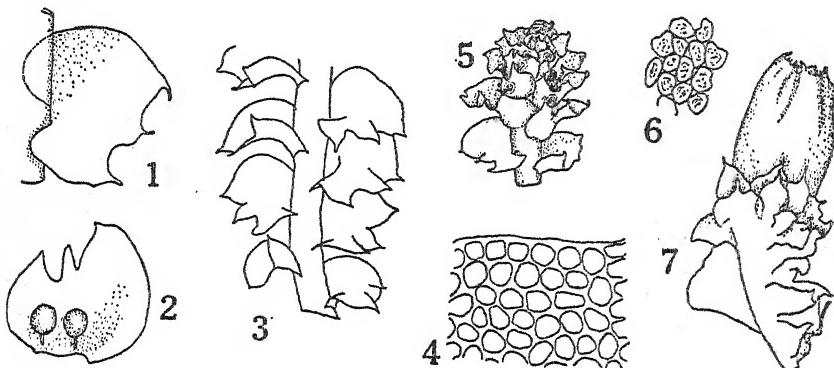
Lophozia quinquedentata Cogn., Bull. Soc. Bot. Belgique 10:279, 1872.

Lophozia lyoni Steph., Bull. Herb. Boissier, Ser. 2, 2:157, 1902; also Sp. Hep. 2:149, 1902.

⁷² He fails to name the figures, but from the description it is evident that he drew this plant.
⁷³ "kwin" kwē dēn tā' tā.

Barbilophosia quinquedentata Loeske, Verh. Bot. Ver. Brandenburg 49:37, 1907.

Plants in patches or mats, dark green to yellowish green. Stems 1-5 cm long, prostrate to ascending, green to brown, often dark brown beneath, little branched. Rhizoids numerous, colorless or brownish. Leaves succubous, the dorsal half almost transversely inserted, half embracing the stem, not or hardly decurrent, imbricate, spreading, the upper half usually reflexed, unequally and simply 3-lobed, rarely 4-lobed, asymmetrically reniform, wider than long, about 1-1.3 mm long and 1.2-1.5 mm wide, somewhat undulate, crispate when dry; margins entire except for the apical lobes; ventral margin widely arched, much longer than the dorsal; lobes triangular, acute to cuspidate, the ventral one much the



Tritomaria quinquedentata. 1, Leaf, dorsal view, $\times 50$. 2, Male bract with two antheridia, $\times 17$. 3, Part of sterile shoot, dorsal view, $\times 8.8$. 4, Cells along the leaf margin, $\times 176$. 5, Dorsal view of male inflorescence, $\times 15.5$. 6, Leaf cells, $\times 258$. 7, Tip of plant with perianth, $\times 15.5$. (1, 5-7, after Haynes; 2, after Pearson; 3, after Jensen; 4, after Gil.)

largest; sinuses descending $\frac{1}{6}$ - $\frac{1}{4}$ the total leaf length, acute to obtuse or rounded, gibbose. Cells of the leaf middle 23-25 μ , of the leaf tips 15-20 μ , of the base 25-28 μ , rounded polygonal; walls thin; trigones large but not bulging into the cells; oil bodies numerous; cuticle verruculose. Gemmae not common, in groups at the tips of the lobes of the upper leaves, ovoid to elliptic or 3-4-angled, yellowish green, 1-2-celled. Underleaves wanting, or rarely some near tip of stem, small, lanceolate or bilobed. Plants unisexual; both inflorescences terminal. Male plants in the same patches as the female or in separate ones; male bracts 8-40, crispate, saccate at base, the two most dorsal lobes curved forward and upward along the stem; antheridia 2-3, globose, shortly stalked, among a few lanceolate paraphyses. Female bracts wider than the leaves, erect with spreading tips, 3-5-lobed, plicate, the lobes sometimes dentate; bracteole more or less

bilobed, variable in form, connate with the bracts for much of its length. Perianth about $\frac{3}{4}$ -emergent, clavate to pyriform or oblong-obovoid, several cells thick from base to middle, many-plicate from the middle upward, roundedly to obtusely narrowed to the mouth; mouth shortly lobed, unequally ciliate, the cilia 4 or more cells long; cells near mouth 20-25 μ , squarish, with trigones. Seta about 2 cm long. Sporangium oblong-ovoid, yellowish or reddish brown, its wall of 5 layers⁷⁴ of cells; epidermal cells with nodular thickenings; innermost layer of cells with partly incomplete semiannular thickenings. Elaters about 150 μ long and 6 μ thick; spirals 2, reddish brown. Spores 12-15 μ , verrucose, yellowish brown. So named because the female bracts sometimes are 5-lobed.—On soil on banks, on rocks, on trunks of trees; arctic and alpine or subalpine.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 298; Haynes, Bryologist 10: pl. 2, figs. 8-11, 1907; Macvicar (374) 193, figs. 1-4; Warnstorf (523) 209, fig. 4; Pearson (433) 2: pl. 146; Buch, Mem. Soc. Fauna Fl. Fennica 8:285, fig. 1, 26-31, 1932; Meylan (386) fig. 96; Gil (76) fig. 226.

EXAMINATIONS: Mich. Isle Royal (C. E. Allen and others) 1901, and (Holzinger 2) 1912; Neguanee in Marquette County (Nichols) 1935.—Ont. Sudbury Junction (Macoun 67) 1884.—Que. Cape Aigle (Macoun 3157) 1905.

TYPE LOCALITY: European.

RANGE: Greenland (322), Arctic Amer. Archipelago (248.1), Devon Isl. (485.6), Baffin Isl. (277.2), Melville Penin. (277.2), District of Keewatin (485.6), Labrador (510), Que. (178), Ont. (373), Mich., Manitoba (431), Alta. (373), Yukon (298), Alaska (173), B. C. (508), Minn. (212), Wis. (98), Mich. (485.1), Conn. (212), Vt. (139), N. H. (359), Me. (363), N. B. (373), N. S. (53.2); Asia (350); Eur. (325); Spitzbergen (524.3); Jan Mayen Isl. (248.1); Iceland (248.1).

SACCOBASIS⁷⁵ Buch, Mem. Soc. Fauna Fl. Fennica 8(1932):291, 1933.

Jungermannia Nees Naturg. Eur. Leberrm. 2:145, 1836, in part.

Sphenolobus Steph., Bull. Herb. Boissier, Ser. 2, 2:164, 1902; also Sp. Hep. 2:156, 1902, in part.

Tritomaria Schiffn., Annkgs. Beilage Ber. Naturw. Ver. Innsbruck 31:12, 1908.

Stem prostrate or mostly ascending to erect, hardly curved toward the dorsal side at tip, often dorsally brownish and ventrally vinous red; cortex 1-2 cells thick, thickly walled; the cells on the dorsal side 5-8 times as long as wide, narrower but much longer than the leaf cells; the cells of the ventral side 1-3 times as long as wide; interior stem cells distinctly larger than the cortical ones, 4-8 times as long as wide except shorter toward the ventral side of the stem. Leaves almost transversely inserted, erect-spreading, 3-lobed, almost rectangular in general outline, saccate at base and either half-cylindric throughout or the dorsal half bent back above the saccate base; leaf insertion concave, the ventral half strongly succubous and rather longer than the dorsal half, the dorsal half strongly incubous, both sides ending in a curve toward the stem base; lobes broadly

⁷⁴ Warnstorf (523) says it is only two cells thick.

⁷⁵ sæk ə bā' sis.

triangular, obtuse; sinuses shallow, wide, obtuse to rounded. Cells similar throughout, isodiametric but toward base slightly longer than wide; wall thin; trigones distinct, bulging into the cells when mature; cuticle smooth or nearly so. Underleaves wanting, replaced by simple slime papillae. Plants unisexual; both inflorescences terminal. Male bracts more saccate at base than the leaves. Female bracts with deeper sinuses than the leaves. Mouth of the perianth entire.—Name from *L. saccus*, sack, and *basis*, the base; in reference to the saccate base of the leaves.

1. *Saccobasis polita*⁷⁶ (Nees) Buch, Mem. Soc. Fauna Fl. Fennica 8 (1932) :292, 1933.

Jungermannia polita Nees Naturg. Eur. Leberrm. 2:145, 1836.

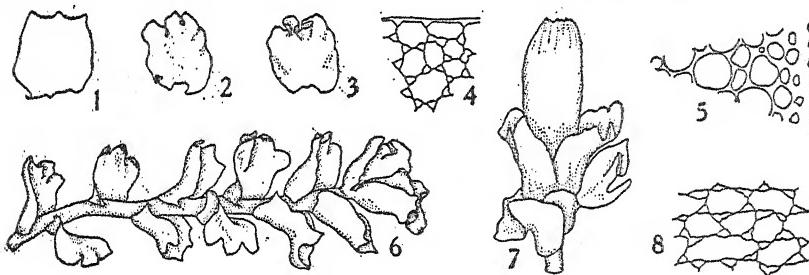
Diplophyllum politum Dum. Hep. Eur. 50, 1874.

Sphenolobus politus Steph., Bull. Herb. Boissier, Ser. 2, 2:177, 1902; also Sp. Hep. 2:169, 1902.

Lophoszia polita Boulay Musc. France 2:102, 1904.

Tritomaria polita Schiffn., according to Loeske, Hedwigia 49:13, 1909-1910.

Plants scattered or in loose patches among mosses, yellowish green to brownish or reddish to blackish, with a fatty lustre; leafy shoots 2-3 mm wide. Stems 1-3 cm long, decumbent and arcuate below, ascend-



Saccobasis polita. 1-3, Leaves, x 5.3. 4, Cells along upper part of leaf margin, x 141. 5, Part of cross section of stem from center out, x 141. 6, Sterile shoot, dorsal view, x 5.3. 7, Tip with perianth, dorsal view, x 5.3. 8, Cells from basal region of leaf, x 141. (1-3, 6-7, after K. Mueller; 4-5, 8, after Buch.)

ing to erect above, simple or forked, thick, rigid, brown above, dark purple underneath, innovating beneath the female inflorescence. Rhizoids rather numerous below, scarce or almost none on the upper parts, vinous red at base but otherwise colorless. Leaves almost transversely inserted, not decurrent, distant to somewhat imbricate, spreading to almost squarrose from an erect sheathing base, truncately and simply 3-lobed at tip, subquadrate, concave, plicate-undulate toward tip; margin entire except for the 3 lobes; lobes short, obtuse, sometimes hardly present; sinuses descending $\frac{1}{10}$ - $\frac{1}{4}$ the leaf length, acute to crescentic. Cells of the leaf

⁷⁶ pō lit' ä.

middle 32-45 μ , of the margin slightly smaller, of the base somewhat larger; walls thin; trigones somewhat bulging into the cells; cuticle nearly smooth, somewhat striate-verruculose near base. Gemmae in clumps on the tips of the leaf lobes, triangular to polyangular, often star-shaped, reddish brown. Underleaves wanting. Plants unisexual; both inflorescences terminal. Male bracts several pairs, similar to the leaves, concave, more saccate at base than the leaves, erect-spreading, imbricate; antheridia 2-4, ovoid-globose, short stalked. Female bracts erect, similar to the leaves but more plicate and 3-5-lobed; the lobes rather lingulate. Perianth free from the female bracts, $\frac{1}{2}$ - $\frac{2}{3}$ -emergent, nearly cylindric, obtusely contracted to the mouth; mouth entire. Seta 1-2 cm long, in cross section its cells subequal. Sporangium ovoid; epidermal cells with nodular thickenings; inner wall cells with semiannular thickenings. Elaters about 150 μ long and 8 μ thick; spirals 2, reddish brown. Spores about 15 μ , reddish brown. Name the *L. politus*, polished, in reference to its fatty lustre.—On weathered granite.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 297; Meylan (386) fig. 95; Macvicar (374) 215, figs. 1-3; Buch, Mem. Soc. Fauna Fl. Fennica 8:291, fig. 2, 1-10, 1932.

EXAMINATIONS: Alta. Banff National Park (Rakestraw) 1937; near Peyt Glacier in Banff National Park (Rakestraw) 1937; Waterton National Park (Rakestraw) 1937.

TYPE LOCALITY: "Radstadter Tauern" in the Salzburg district (Funck). S. Germany or Austria.

RANGE: Greenland (364), Melville Penin. (485.6), Que. (364), N. J. (504), Alta. (462), Alaska (364), B. C. (364); Eur. (374).

BARBILOPHOZIA⁷ Loeske, Verh. Bot. Ver. Brandenburg 49:37, 1907.

Lophozia subgenus *Barbilophozia* K. Muell. 6(1):622, 1910.

Jungermannia section *Barbatae* C. Jensen Danmarks Mosser, Bryofyter 1:110, 1915.

Jungermannia subgenus *Barbilophozia* Arn., Arkiv f. Botanik 19(10):22, 1925.

Leafy shoots 1.5-5 mm wide. Stems prostrate to erect, unbranched or forked; ventral surface of the stem constituting only about $\frac{1}{5}$ - $\frac{1}{4}$ of the whole circumference; dorsal epidermal cells 4 or more rows, 1-1.5 times as long as wide; ventral cortex of 2-3 cells, grading into the interior cells, the epidermal cells about as long as wide, the hypodermal layer 1-3 times as long as wide; interior cells somewhat wider, 3-6 times as long as wide; cross section slightly wider than thick, the cortical cells from the same size as to rather smaller than the interior ones, all walls thin except the slightly thicker cuticular one. Rhizoids numerous, colorless. Leaves quite succubous, the insertion sometimes almost parallel to the stem but curved ventrally at its anterior end, somewhat dorsally decurrent, simply

⁷"bär" bī lō fō' zī ā. Buch (56.5) has very much narrowed the genus from the description originally given by Loeske. We are following Buch in this.

2-5-lobed but typically 4-lobed, widest about their middle, the lobes equal or the marginal ones the smaller and sometimes mere teeth or entirely wanting; dorsal margin equal to or shorter than the ventral one, ventral margin of most of the leaves with 1 or more cilia; sinuses usually descending $\frac{1}{6}$ - $\frac{1}{3}$ the leaf length, acute to obtuse or rounded. Cells of the leaf middle 20-28 μ ; trigones small. Gemmae on the tips of the leaves, 1-2-celled, mostly angular. Underleaves present, unlobed or 2-lobed. Plants unisexual. Male bracts with 2-6 antheridia each. Female bracts 4-5-lobed; bracteole with 2 or 4 lobes, sometimes entire, ciliate or dentate. Perianth plicate about $\frac{1}{3}$ - $\frac{1}{2}$ down, gradually contracted to mouth; mouth not entire. Sporangium exserted; wall 3-4 cells thick; epidermal cells larger than the others, nodular; innermost wall cells semiannular. The name is from L. *barba*, beard, and the genus *Lophozia*; in reference to the ciliate leaves of many of the species originally referred to it.

- | | |
|---|------------------------------|
| Leaf margin entire to dentate; underleaves wanting or present among bracts only, small, entire to ciliate; female bracteole dentate, 2-lobed and also variously laciniate. | 1. <i>B. barbata</i> . |
| Leaf margin ciliate; underleaves moderately abundant, rather large, ciliate; female bracteole ciliate. | 2. <i>B. lycopodioides</i> . |
| Gemmae rare; female bracteole unequally 4-lobed with the 2 outer ones sometimes quite short; mouth of perianth ciliate; leaf lobes triangular. | 3. <i>B. hatcheri</i> . |

1. *Barbilophozia barbata*⁷⁸ (Schmidel) Loeske, Verh. Bot. Ver. Brandenburg 49:37, 1907.

Jungermannia barbata Schmidel Icon. Pl. 187, 1747; also Icon. et Annal. 187, pl. 48, 1783.

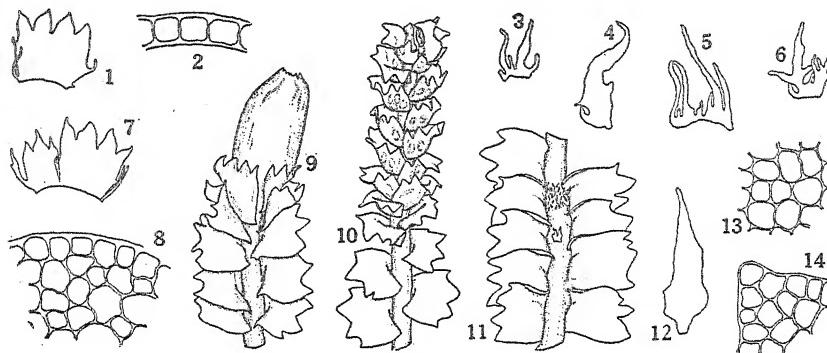
Lophozia barbata Dum. Rec. d'Obs. 17, 1835.

Jungermannia barbata var. *schreberi* Nees Naturg. Eur. Leberrm. 2:189, 1836.

Lophozia (Barbilophozia) barbata K. Muell., Rabenh. Krypt.-Fl. 6(1):656, 1910.

Plants in loose depressed mats, brownish or yellowish green to dark green; leafy branches 2.5-5 mm wide. Stems 3-8 cm long, procumbent to ascending, simple or furcate; branches long; often flagelliferous beneath the perianth; cross section elliptic; the 2-4 rows of cortical cells smaller and thick walled; its interior cells large, thin walled, with trigones. Rhizoids numerous, short, colorless. Leaves succubous, very obliquely inserted, decurrent on the dorsal margin, imbricate, horizontally widely spreading, simply 3-5-lobed, obtuse-quadrate, averaging about 1.5 mm long and wide, symmetric, half-embracing the stem, not crispat when dry; apex in general form truncate to broadly rounded; margin entire except for the apical lobes, or sometimes with abortive teeth near base on

⁷⁸ bär bā' tā.



Barbilophozia barbata. 1, Female bract, \times about 6. 2, Part of cross section of leaf, \times about 106. 3, Underleaf, \times about 17. 4, Antheridial paraphysis, \times about 7. 5, Underleaf, \times about 17. 6, Antheridial paraphysis, \times about 7. 7, Female bracts and bracteole, \times about 6. 8, Part of cross section of stem, \times about 265. 9, Tip of plant with female inflorescence, dorsal view, \times about 6. 10, Male inflorescence, dorsal view, \times about 6. 11, Part of sterile stem, ventral view, with numerous short rhizoids shown at one region only, \times about 7. 12, Antheridial paraphysis, \times about 7. 13, Cells of the leaf middle, \times about 106. 14, Cells of the leaf apex, \times about 106. (All after Evans.)

one or both margins, the two lateral margins about the same in length; lobes 4, or rarely 3 or 5, lying almost parallel to the stem, the two marginal ones slightly smaller, ovate-triangular to ovate-oval, obtuse or more rarely acute; sinuses descending $\frac{1}{6}$ - $\frac{1}{4}$ the leaf length, obtuse to rounded. Cells of the leaf middle $23\text{-}25 \mu$, of the apices slightly smaller, of the base slightly larger, rounded-polygonal; walls thin; trigones small but distinct; cuticle somewhat granulate. Gemmae rare, in clusters at the apices of the lobes of the leaves, oblong to 3-6-angled, 1-2-celled, reddish yellow. Underleaves usually wanting, or present only near tips of stems, small, subulate to lanceolate, simple or 2-lobed, entire to ciliate at margins. Plants unisexual; both inflorescences terminal. Male plants sometimes in separate mats; male bracts closely imbricate, ventricose; the dorsal margin with 1-2 teeth, bent forward and thus better covering the antheridia; antheridia 2-5, large, oval, among paraphyses. Female bracts resembling the leaves and about the same in size, more deeply lobed, the lobes longer and more or less spinose-dentate, the sinus often gibbose; bracteole large, ovate, 2-lobed and again variously laciniate. Perianth $\frac{4}{5}\text{-}\frac{5}{6}$ -emergent, oblong, deeply 6-8-plicate in the upper third; mouth constricted, crenulate or dentate with projecting cells. Seta 2 cm long. Sporangium ovoid, wall of 4 layers of cells; epidermis of cells twice as large as those of the other layers, with nodular thickenings; inner and intermediate layers with incomplete semiannular thickenings. Elaters 8μ thick, spirals 2, reddish brown. Spores 15μ , verrucose, yellowish brown. Name from L. *barba*,

beard, because the tips of the lobes of the leaves end in a hair.—On moist walls and banks, not at high elevations.

ILLUSTRATIONS: Evans, Pl. World 1: pl. 4, 1898; Pearson (433) 2: pl. 148; K. Mueller (409) 1: fig. 307; Macvicar (374) 202, figs. 1-4; Warnstorff (523) 209, fig. 3; Meylan (386) fig. 102; Gil (76) figs. 227-228; Underwood (506) pl. 25, Jungermannia 2.

EXAMINATIONS: B. C. Pass Creek Falls near Sproat (Macoun 278) 1890.—Mont. Glacier National Park (Rakestraw) 1937.—N. Y. Little Moose Lake in Herkimer County (Haynes 631) 1904.—Ont. Lake Nipissing (Macoun 67) 1884; Nipigon (Jennings) 1912; Ottawa (Macoun 174) 1884; Sudbury Junction (Macoun 67) 1884.—Que. Cape Aigle (Macoun 3153) 1905; Gaspe (Macoun 43) 1882; Ironsides (Macoun 174) 1884.—Wash. Spokane (Bonser) 1907.

TYPE LOCALITY: European.

RANGE: Greenland (248), Melville Penin. (485.6), Labrador (510), Miquelon Isl. (431), N. S. (53.2), N. B. (369), Me. (369.1), N. H. (359), Vt. (140), Mass. (235), Conn. (140), N. J. (212), N. Y. (258), Que. (178), Ont. (373), Mich. (419), Wis. (79.3), Minn. (94.1), Colo. (175), Mont. (81), Alta. (373), Yukon (298), Alaska (190), B. C. (373), Ida. (508), Wash. (81), N. Mex. (496); Asia (248.1); Eur. (394.1); Iceland (248.1).

It is rarely found reproducing, either sexually or by gemmae.

Just what Hooker (285) illustrated in his pl. 70 as *Jungermannia barbata* is not clear. Nees (410) 2:185 refers it to *Jungermannia lycopodioides*, Underwood (504) to *Jungermannia attenuata*. For *J. lycopodioides* Hooker's figures show the leaves too much in 3's, the cilia of the leaf margin represented by only one tooth, the underleaves not sufficiently ciliate. For *J. barbata* his figures show the leaves too apiculate and too many leaves 3-toothed, the marginal leaf tooth too well developed. For *J. attenuata* the leaves are too sharply pointed, the ventral marginal tooth too well developed, and the underleaves quite the wrong form. Since Ekart (124) took most of his drawings from Hooker (285), his plate 12, fig. 102 is also in question.

2. *Barbilophozia lycopodioides*⁷⁹ (Wallr.) Loeske, Verh. Bot. Ver. Brandenburg 49:37, 1907.

Jungermannia lycopodioides Wallr. Fl. Crypt. Germ. 1:76, 1831.

Jungermannia barbata var. *lycopodioides* Nees Naturg. Eur. Leberm. 2:185, 1836.

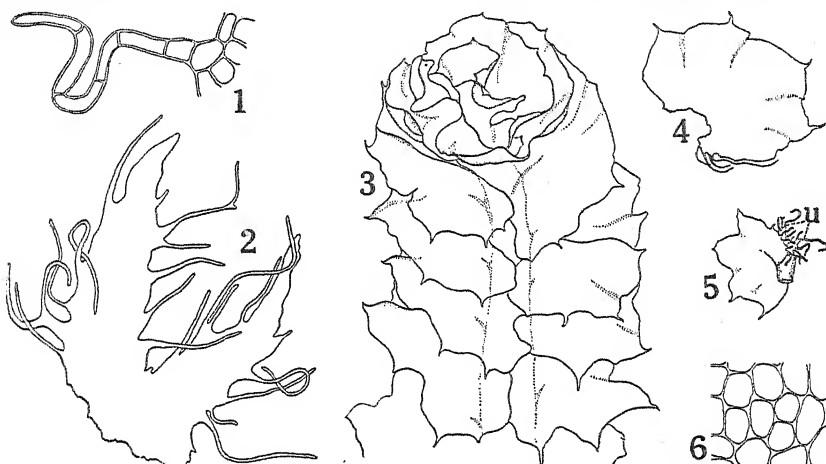
Lophozia lycopodioides Cogn., Bull. Soc. Bot. Belgique 10:278, 1872.

Lophozia (*Barbilophozia*) *lycopodioides* K. Muell., Rabenh. Krypt.-Fl. 6(1):627, 1910.

Plants in loosely compressed mats or among mosses, green to usually straw-colored yellow; leafy branches 4-5 mm wide. Stems up to 8 cm long, prostrate, simple or often furcate. Rhizoids numerous, colorless. Leaves succubous, dorsally decurrent, imbricate, widely and somewhat horizontally spreading, simply 3-5-lobed, reniform, unsymmetric, normally about 1.5 mm long and 2.5 mm wide, about half-embracing the stem; ventral margin longer than the dorsal, with long branched or unbranched cilia composed of cells several times as long as wide, entire except for the lobes and cilia; apex rounded in general form; lobes usually 4, occasionally 3 or 5, not quite alike in width, broadly triangular,

⁷⁹ li" kō pō dī ói' dēs.

obtuse to apiculate, the apiculus one cell thick and one or 2 cells long; sinuses descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, acute to rounded, about equal in depth on the same leaf. Cells of the leaf middle about 20-28 μ , those of tips averaging slightly smaller and of the base slightly larger, rounded-polygonal; walls thin; trigones small but distinct; cuticle nearly smooth. Gemmae rare, in clusters on the lobes of the leaves at the tips of the stems, irregularly and obtusely three- to many-angled, about 20 μ , 1-2-celled, reddish brown. Underleaves common, large, deeply 2-lobed or



Barbilophozia lycopodioides. 1, Cilium from base of leaf, $\times 151$. 2, Underleaf, $\times 29$. 3, Tip of plant, dorsal view, $\times 8.5$. 4, Leaf, $\times 8.5$. 5, Leaf and underleaf (u), $\times 4.2$. 6, Cells of the leaf middle, $\times 150$. (5, after K. Mueller; others original, by Elizabeth Curtis.)

rarely lanceolate, the whole margin with long cilia; lobes about 6 cells wide at base, ending in a long cilium; the sinus acute. Plants unisexual. Male inflorescence along the branches; male bracts closely imbricate, with the two dorsal lobes smaller and curved toward the stem, thus making the bracts saccate, ventral margin ciliate; antheridia several, large, globose, among numerous lanceolate paraphyses. Female bracts similar to the leaves, more plicate, usually more deeply lobed, the sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the bract length, the lobes often ending in a long cilium, the dorsal margin of the bracts also ciliate; bracteole large, unequally about 4-lobed with the lobes mostly ending in cilia, margin somewhat ciliate. Perianth about $\frac{3}{5}$ -emergent, oblong, 5-6 mm long, slightly compressed, several cells thick at base, plicate in the upper $\frac{1}{3}$ - $\frac{1}{2}$; mouth contracted, shortly incised, ciliate, the cilia 1-3 cells long. Seta about 15 mm long; in cross section the cells all similar and irregularly arranged. Sporangium ovoid, blackish brown, the wall of 3 layers of cells; epidermal layer of large

cells, with nodular thickenings; inner layer of small cells, with semiannular thickenings. Elaters 10 μ thick; spirals 2, tightly wound, dark brown. Spores 12-14 μ , muriculate, brown. The name apparently from the creeping Lycopodium-like habit.—On earth, rocks and grassy slopes; on high mountains or in the far north.

ILLUSTRATIONS: Pearson (433) 2: pl. 149; K. Mueller (409) 1: figs. 37, 299; Macvicar (374) 195, figs. 1-4; Meylan (386) fig. 97; Gil (76) figs. 233-234.

EXAMINATIONS: Alta. Lake Louise (Macoun 3040) 1904.—B. C. Kicking Horse Lake (Macoun 163) 1885.—Colo. La Plata Mts. (Eastwood) 1881.—Labrador. Stuparts Bay (R. Bell 1035) 1885.—Manitoba. Lake Winnipegosis (Macoun 41) 1881.—Mont. Piegan Pass in Glacier National Park (Frye) 1928.—N. B. Campbellton (Macoun 1036) 1882.—N. S. Pirates Cove (Macoun 1031) 1883.—Ont. Ottawa (Macoun 129) 1889.—Que. Cape Wales (about Lat. 61° 30' N., Long. 71° 30' W.) (R. Bell) 1884; Fort Chirimo (A. P. Low 1026) 1896; Seal Lake (A. P. Low 56) 1896.—Utah. Bald Mt. in Summit County (Flowers 2136) 1927.—Wyo. Cow Creek Reservoir in Carbon County (Porter 1737) 1934.

TYPE LOCALITY: European.

RANGE: Greenland (322), Baffin Isl. (491), Stuparts Bay on Hudson Strait (431), Labrador (510), Newfoundland (213), N. S. (53.2), N. B. (431), Me. (333), N. H. (355), Que. (178), Ont., Mich. (213), Manitoba (431), Alta. (46.2), Yukon (298), Alaska (298), B. C. (373), Wash. (454), N. Mex. (272), Utah (214.1), Colo. (175), Wyo. (446), Mont. (81); Asia (308.1); Eur. (103.3); Spitzbergen (524.3).

3. *Barbilophozia hatcheri*^{so} (Evans) Loeske, Verh. Bot. Ver. Brandenburg 49:37, 1907.

Jungermannia barbata var. *pusilla* Schiffn. & Schmidt, Lotos 34:25, 1886.
Jungermannia collaris Massal., Atti Soc. Veneto-Trent., So. Nat. Ser. 2, 2:29, 1895. Not of Nees in Preface to Mart. Fl. Crypt. Erlangensis, page xv, 1817.

Jungermannia hatcheri Evans, Bull. Torr. Bot. Club 25:417, 1898.
Jungermannia floerkei var. *baueriana* Schiffn., Oesterr. Bot. Zeitsch. 50(8):6 of reprint, 1900.

Lophozia hatcheri Steph., Bull. Herb. Boissier, Ser. 2, 2:167, 1902; also Sp. Hep. 2:159, 1902.

Jungermannia floerkei var. *aculeata* Loeske Moosfl. Harzes 86, 1903.

Lophozia baueriana Schiffn., Lotos 51(7):9 of reprint, 1903.

Jungermannia baueriana Arn., Bot. Not. 145, 1906.

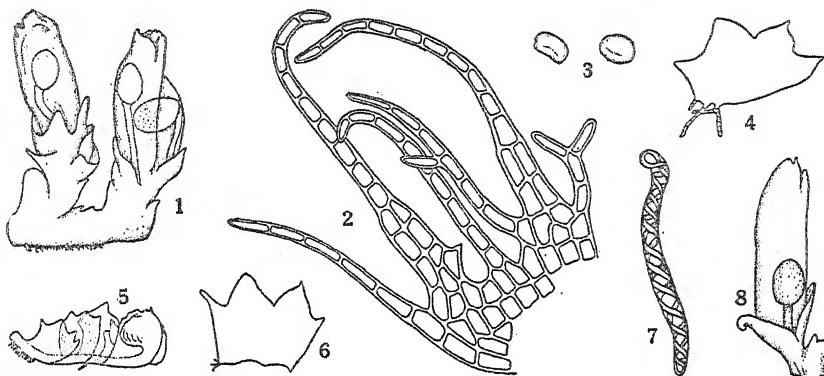
B. baueriana Loeske, Hedwigia 49:13, 1909.

Lophozia (*Barbilophozia*) *hatscheri* K. Muell., Rabenh. Krypt.-Fl. 6(1):631, 1910.

Plants in loose patches, dark green to reddish brown or almost blackish; leafy shoots 1.5-2 mm wide. Stems 2-5 cm long, ascending to erect, green to brown, flexuous; branches few. Rhizoids numerous, colorless, mostly short. Leaves succubous, slightly decurrent on the dorsal margin, approximate to imbricate, horizontal and flat to erect-spreading and concave, with 3 or more (commonly 4) lobes at tip, rhombic to reniform in general outline, as wide or wider than long, the dorsal margin as long or usually longer than the ventral; margin at ventral base with 1-3 long cilia

^{so} hätsch' èr i. K. Mueller (409) 1:631 spells it *hatscheri* using the natural German combination of letters for the sound, but in (409) 2:763, he corrected himself.

composed of cells several times as long as wide; lobes ovate, acute or obtuse, usually cuspidate or apiculate, usually one or more ending in a cilium several cells long, rarely all the lobes obtuse; sinuses descending



Barbilophozia hatcheri. 1, Tip of plant with female inflorescences, $\times 6.3$. 2, Underleaf, $\times 51$. 3, Two spores, \times about 160. 4, Leaf, $\times 12.6$. 5, Sterile shoot, $\times 6.3$. 6, Leaf, $\times 12.6$. 7, Elater, \times about 160. 8, Tip of plant with female inflorescence, $\times 6.3$. (All after Harmsen and Seidenfaden.)

$\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, acute to obtuse, more or less gibbose. Cells of the leaf middle 20-25 μ , of the margin about 15-20 μ , rounded-polygonal; walls thin; trigones small; cuticle smooth. Gemmae common, on the tips of the lobes of the upper leaves, with 3 to many irregular obtuse angles, or occasionally some of them ovoid to oblong-ovoid, 1-2-celled, 20-25 μ . Underleaves common, rather large, 2-lobed for $\frac{3}{4}$ - $\frac{4}{5}$ their length; margins longly ciliate; lobes narrowly triangular, ending in a long cilium. Plants unisexual. Male inflorescence terminal or farther down; male bracts 10-14, imbricate, concave, saccate at base, unsymmetrical, the ventral lobe the largest; antheridia 2-6, broadly ovoid, with short stalk. Female bract 4-5-lobed, the lobes ending in long cilia; bracteole rectangular, unlobed or 2-lobed, the margin with long cilia. Perianth longly ovoid, plicate from about the middle, contracted to the mouth; mouth lobed and shortly toothed. Sporophyte unknown. Named in honor of Dr. John B. Hatcher, who gathered it in the antarctic regions.—On rocks, soil or logs; subalpine.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 301; Meylan (386) fig. 98A; Macvicar (374) 196, figs. 1-6; Harmsen and Seidenfaden, Medd. om Groenland 82(2):17, fig. 1, 1932.

EXAMINATIONS: Alta, Banff National Park (Rakestraw) 1937.—B. C. Kootenay National Park (Rakestraw) 1937.—Colo. Pikes Peak (Porter 2995) 1935.—Ore. Oregon Caves (Frye) 1931; Wallowa Lake (Rakestraw) 1935.—Wyo. Brookdale in Fremont County (Porter) 1934; Buffalo Ten Sleep Road in Johnson County (Porter) 1934; Hidden Falls in Teton County (Porter) 1932.

TYPE LOCALITY: Lapotaia,⁸¹ "Patagonia" (Hatcher).

⁸¹ We are unable to locate it on any of our maps.

RANGE: Greenland (248.1), Ellesmere Isl. (248.1), Baffin Isl. (485.6), District of Keewatin (485.6), Labrador (248.1), N. S. (53.2), Me. (155), N. H. (176), Que. (168), Mich. (485.1), Colo. (175), Wyo. (81), Mont. (81), Alta. (46.2), B. C. (95), Wash. (216), Ore. (82), Cal. (168); S. Amer. (299); S. Georgia Isl. (491); Antartica (299); Novaya Zemlya (299); Eur. (422.2); Jan Mayen Isl. (248.1).

PLAGIOCHILOIDEAE⁸²

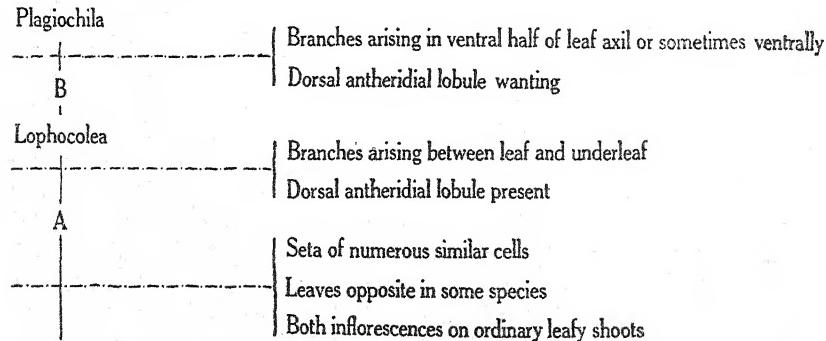
Branches often arising from a prostrate rhizomatous and almost leafless stem, but when from leafy stems they arise in the ventral half of the leaf axil. Rhizoids common on prostrate shoots, scarce on ascending ones. Leaves usually alternate but in some species opposite, nearly transversely inserted to usually strongly succubous; apex rounded to 2-lobed; margin entire to usually dentate or spinose-dentate. Gemmae rare; new plants commonly arising from the surfaces of caducous leaves. Underleaves rarely large enough to be leaf-like, usually wanting, often with ciliary segments. Plants unisexual (ours) or bisexual; both inflorescences on normal leafy shoots. Male inflorescence terminal or below the tip. Female inflorescence terminal; female bracts much like the leaves in size, commonly more dentate, free; bracteole wanting. Perianth laterally compressed near its mouth, the 2 keels sometimes winged; mouth very wide, often 2-lipped, strongly and sharply dentate. Seta in cross section of many similar cells. Sporangial wall 3-8 cells thick. Elaters 2-spiral. There is only the following genus.

RELATIONSHIP OF THE PLAGIOCHILOIDEAE

The remarks under the letters below are pertinent at the corresponding letters on the diagram below.

(A) Rhizoids tufted; underleaves present throughout, free or connate with 1 or 2 leaves; bracteole usually quite large; perianth sometimes showing its origin from 3 leaves.

(B) Rhizoids not tufted, often few; underleaves rarely common, usually wanting, free; bracteole wanting; perianth sometimes showing its origin from 2 leaves.



Phylogenetic diagram of relationship of Plagiochiloideae.

⁸² plă" ji ök" il öi' dë ē.

PLAGIOCHILA^{ss} Dum. Rec. d'Obs. 14, 1835.

Candollea Raddi, Mem. Soc. Ital. Sci. Modena 18:11, 1818, in part.
Martinellia section β Gray Nat. Arr. Brit. Pls. 1:692, 1821.
Radula section *Plagiochila* Dum. Syll. Jung. Eur. 42, 1831.

Plants in patches or mats, rarely single among other bryophytes, yellowish green to dark green or somewhat brownish or reddish; leafy shoots 1.5-8 mm wide. Stems 0.5-20 cm long, prostrate to erect, commonly with branches ascending from a prostrate rhizomatous and almost leafless stem, rarely pale, usually brownish to reddish or blackish, simple to variously branched; rejuvenations commonly occurring beneath the perianth; branches arising in the ventral half of the leaf axil. Rhizoids common to abundant on the prostrate portion, scarce on the ascending branches, colorless. Leaves alternate (in ours), or opposite, usually strongly succubous but in some nearly transversely inserted, from not decurrent to strongly so both dorsally and ventrally; apex rounded or truncate to distinctly 2-lobed; margin rarely entire to usually strongly dentate or spine-dentate, dorsal margin commonly nearly straight, the ventral one commonly strongly arched. Cells of the leaves various, so also are the walls and trigones. Gemmae rare; more commonly new shoots are formed on the surfaces of caducous leaves or parts of leaves. Underleaves usually wanting, sometimes minute, in rarer cases large enough to be leaf-like, often with ciliary segments. Plants unisexual (ours), or very rarely bisexual. Male inflorescence terminal, or farther down through continued growth of the normally leafy male shoots; antheridia 1-10 per bract but usually 2. Female inflorescence terminal on a normally leafy shoot; female bracts not greatly differing from the leaves in size, commonly more dentate, free from each other; bracteole wanting. Perianth cylindric to obovoid or campanulate, laterally compressed in the upper part, the two keels sometimes winged; mouth wide, commonly the widest part of the perianth, often somewhat 2-lipped, strongly and sharply dentate. Seta 2-5 cm long, in cross section of many similar cells. Sporangium ovoid or rarely oblong-ovoid, its walls 3-8 cells thick. Elaters with 2 spirals. Spores smooth. The name from Gk. *plagios*, sloping, and *cheilos*, lip; in reference to the sloping mouth of the perianth.

According to Carl (Ann. Bryol., Suppl. 2:1, 1931) there are more than 1300 species of which only a small per cent occur outside the tropics; yet two of ours occur in Greenland and two others in Alaska. To appreciate the chaotic condition of the knowledge of the 15 North American species, observe: (a) In only one species have both male and female inflorescences and also the sporophyte been seen. (b) In only six species has the female inflorescence been observed. (c) In only two is the male inflorescence known. (d) In only one has the sporophyte been seen.

^{ss} plä jí ök' i lä.

- A. Most of the leaves entire or nearly so, circular to wider than long 1. *P. arctica*.
- AA. Most of the leaves distinctly toothed or lobed, and in most species distinctly longer than wide.
- B. Leaves distinctly 2-lobed for $\frac{1}{4}$ - $\frac{1}{3}$ their length, occasionally with an additional ventral lobe or tooth..... 2. *P. tridenticulata*.
- BB. Most of the leaves not 2-lobed or if so the lobes again irregularly lobed.
- C. Young leaves more or less distinctly 2-lobed with the lobes again irregularly lobed; older leaves various through the falling off of their secondary lobes; trigones of the leaf middle large to slightly bulging. 3. *P. caduciloba*.
- CC. Most of the leaves not 2-lobed, the older leaves not losing their projections through falling off of teeth or secondary lobes; trigones various.
- D. Leaves not or hardly undulate.
- E. Leaves not long decurrent ventrally, or when so the decurrent part not toothed.
- F. Leafy shoots 1.5-3 mm wide or narrower in their widest part.
- G. Trigones near leaf middle wanting to minute.
- H. Stems 0.5-1 cm long; underleaves minute... 4. *P. sullivantii*.
- HH. Stems 1-3 cm long; underleaves wanting.. 5. *P. virginica*.
- GG. Trigones near leaf middle moderately large to bulging.
- I. Leaves not decurrent ventrally.
- J. Stems 1.5-3 cm long; leaves averaging about 1.6 mm long and 1.1 mm wide, their teeth rather low and mostly blunt; underleaves wide and leaf-like..... 6. *P. columbiana*.
- JJ. Stems 0.8-1.5 cm long; leaves averaging about 1 mm long and 0.5 mm wide, their teeth well developed and mostly sharply pointed; underleaves of ciliary segments. 7. *P. austini*.
- II. Leaves decurrent ventrally.
- K. Margin of the leaf with 2-7 teeth; leaf insertion less than semicircularly curved..
- KK. Margin of the leaf with 12-30 teeth; leaf insertion semicircularly curved.
- L. Leaf width nearly or quite as great as length from highest point of insertion to tip; total number of leaf teeth 12-15; trigones in the leaf middle rather large but not bulging into the cells 9. *P. fryei*.
- LL. Leaf width distinctly less than leaf length; total number of leaf teeth 15-30; trigones in the leaf middle large to bulging.
- M. Leafy shoots about 1.5 mm wide; stems about 150μ thick; leaves spreading at 45 degrees or less... 10. *P. alaskana*.
- MM. Leafy shoots about 2.7 mm wide; stems about 260μ thick; leaves spreading at 60-70 degrees..... 11. *P. sharpii*.
- FF. Leafy shoots 3-5 mm wide or wider in their widest part.
- N. Leaf margin as a whole with 4-9 teeth; leaves 2-3 times as long as wide; perianth campanulate, about 1.2 mm long and 1 mm thick. 12. *P. smallii*.

NN. Leaf margin as a whole with 0-35 teeth; leaves mostly less than twice as long as wide; perianth oblong to clavate, 4-7 mm long, 1.6-3.7 mm thick.....

13. *P. asplenoides*.

EE. Leaves long decurrent ventrally, the decurrent part wide and toothed.....

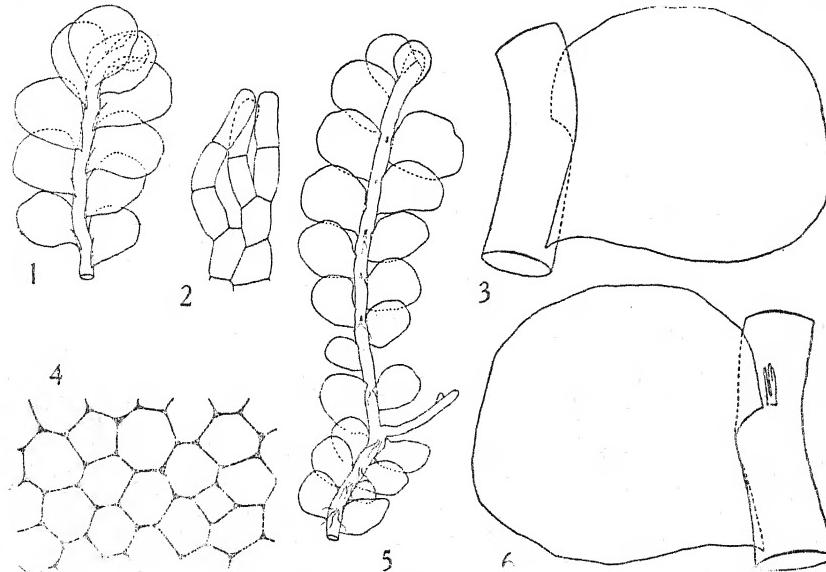
15. *P. ludoviciana*.

DD. Leaves distinctly undulate along the dorsal margin; ventral margin strongly and widely decurrent....

14. *P. undata*.

1. *Plagiochila arctica*⁸⁴ Bryhn & Kaal., Rept. Second Norwegian Arctic Exped. in the "Fram" 1898-1902, 11:41, 1906. Not of Kaal. in Bryhn, Nyt. Mag. Naturvid. 46:41, 1907, according to Joergensen (325).

Plants in thin patches or more rarely among other bryophytes, yellowish green to brownish green or the older parts often brown; leafy shoots 1.8-3 mm wide. Stems 1-5 cm long, ascending to erect from a creeping rhizome, flexuous, 200-300 μ thick, yellowish brown, the tip often curved toward the ventral side, sometimes simple but usually branched; branches lateral, rather numerous, short, sometimes fasciculate, densely leafy except toward base where the leaves are much smaller and distant, the short fasciculate branches densely leafy toward their tips; the rhizomes thick, rigid: cross section of stem oval, dorsiventrally compressed, about 12 cells thick; the cortical cells in 1-2 layers, smaller than



Plagiochila arctica. 1, Shoot, dorsal view, x 7. 2, Underleaf, x 250. 3, Leaf, dorsal view, x 24. 4, Cells of leaf middle, x 250. 5, Shoot, ventral view, x 7. 6, Leaf, ventral view, x 24. (All original, by Nellie Wasson, drawn from E. Lepage's No. 1735 from Rimouski, Quebec.)

⁸⁴ ark' tī kä.

the interior ones, 15-20 μ ; the interior cells irregular in size, 20-50 μ , with thin walls. Rhizoids numerous especially on the rhizomes and lower ends of the branches which arise near the ground, colorless or somewhat yellowish. Leaves alternate, succubous, dorsally slightly decurrent with the line of insertion curved less than a semicircle, on upper part of the stem imbricate to densely crowded, on lower part more distant, erect to erect-spreading, somewhat appressed to slightly complanate, roundish reniform to rarely roundish oval, concave, about the same in length and width, up to 1.4 mm long, rounded to truncately retuse at tip; leaves of the bases of branches and of stoloniform branches much smaller and distant; margins of leaves somewhat reflexed, the dorsal one more so than the ventral, both the margins entire to sinuate, the smaller leaves entire. Cells of leaf middle 20-35 μ , of margin 16-28 μ , of base about 24 by 40 μ ; walls rather thin; trigones wanting or small; cuticle slightly verruculose. Gemmae unknown. Underleaves common, lanceolate-subulate, sometimes 2-lobed, the lobes or the whole underleaf commonly mere cilia, erect or appressed, commonly 100-150 μ long but sometimes reaching 300 μ . Reproductive organs and sporophyte unknown. The name evidently from the arctic habitat.—On soil or among other bryophytes.

ILLUSTRATIONS: Arnell, Arkiv f. Bot. 13: pl. 1, figs. 12-21, 1913.

EXAMINATIONS: Que. Rimouski (Lepage 1735) 1940.

TYPE LOCALITY: Havnefjord, where the Fram remained during the winter of 1899-1900, on the south shore of Ellesmere Island, may be so considered; about Lat. 76° 30' N., Long. 87° 47' W.

RANGE: Greenland (56.01), Ellesmere Isl. (56.01), North Kent Isl. (56.01), Que.; Asia? (Arnell, Arkiv f. Bot. 13:19, 1913); Eur.? (325).

The description of *P. arctica* is almost entirely original. Bryhn reported (Nyt. Mag. Naturvid. 46:41, 1907) material so named by Kaalaas, probably from the Scandinavian Peninsula; we do not have the publication. Arnell reports it from the Lena Valley in Siberia (Arkiv f. Bot. 13:19, pl. 1, figs. 12-21, 1913; his plate was drawn by C. Jensen). On the material reported by Bryhn (in Nyt. Mag. above) Joergensen (Bergens Mus. Skrift. 16:173, 1934) bases a new variety, *P. asplenoides* var. *subarctica*, and has left us as well as himself (see his page 174) in doubt as to whether the American material is distinct or not. Our description and figures are of American material, and we found no leaves with marginal teeth. Arnell says the well developed leaves have teeth but he shows no teeth in his figures. Possibly in the most favorable habitats the larger leaves form teeth and thus approach more nearly the usual *Plagiochila*.

2. *Plagiochila tridenticulata*⁸⁵ Dum. Rec. d'Obs. 15, 1835.

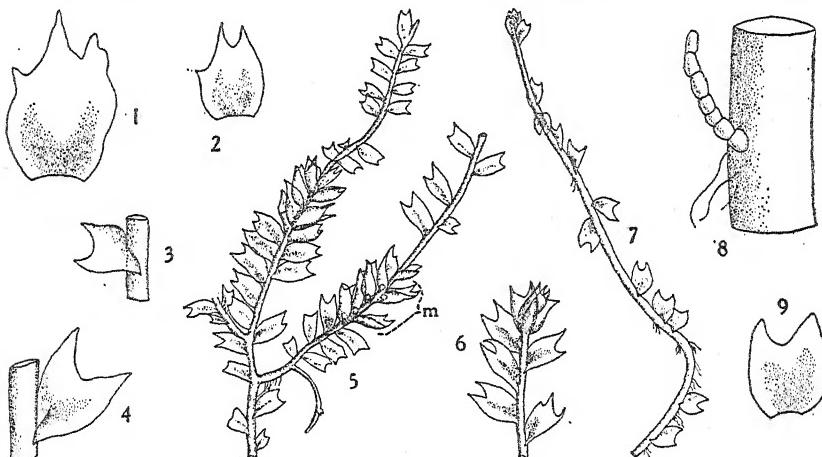
P. exigua Tayl., Trans. Bot. Soc. Edinburgh 1:179, 1843.

Jungermannia exigua Tayl., Trans. Bot. Soc. Edinburgh 1:179, 1843.

Plants in patches or mats, olive to pale green but drying nearly black; leafy shoots 0.8-1.5 mm wide. Stems 1-3 cm long, flexuous, filiform but

⁸⁵ tri" děn tǐk ū lá' tā.

rigid, simple or with few branches, often with innovations below the male inflorescence. Rhizoids few but occurring to near stem tip, colorless. Leaves alternate, quite succubous but less than semicircularly inserted, dorsally not or little decurrent and ventrally not at all so, distant to approximate, horizontally erect-spreading to spreading, distinctly 2-lobed, narrowly ovate, 500-750 μ long, about 500 μ wide, somewhat concave, narrow at base, firm, caducous and therefore some of them wanting; dorsal margin entire, nearly straight to usually somewhat arched; ventral margin entire or near its middle with 1-2 teeth which when large might be considered lobes, slightly to considerably arched; the two chief lobes triangular, acute to acuminate, the ventral the larger; the sinus between the two largest lobes acute to crescentic, descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length.



Plagiochila tridenticulata. 1, Leaf, occasional one, $\times 36$. 2, Male bract, $\times 20$. 3-4, Leaves, attached, $\times 36$. 5, Part of plant, dorsal view, with male inflorescence (*m*), $\times 10.2$. 6, Tip of shoot, dorsal view, $\times 10.2$. 7, Shoot, dorsal view, $\times 10.2$. 8, Piece of stem with underleaf, $\times 36$. 9, Leaf, $\times 36$. (All after Pearson.)

Cells of the leaf middle 20-30, of the upper regions of the lobes about 25 μ ; walls thick; trigones from small in shaded plants to large in most plants; cuticle smooth. Gemmae unknown. Underleaves wanting or rather scarce, small, subulate to filiform. Plants unisexual. Male inflorescence on a normal leafy shoot, terminal or farther down, oblong-ovate; male bracts 8-10, about the same size as the leaves, loosely to closely imbricate, sharply 2-4-toothed at tip, the teeth lanceolate-subulate; dorsal margin of male bract with an additional tooth; antheridium usually only 1. Female inflorescence and sporophyte unknown. The name the *L. tridenticulatus*, having 3 small teeth; the occurrence of three projections on the leaf margin.

is not common, but they are distinct when present.—In shady ravines; on rocks and trunks of trees, or among other bryophytes.

ILLUSTRATIONS: Pearson (433) 2: pls. 118-119; Carrington, Brit. Hep. pl. 3, fig. 10, and pl. 4, fig. 13, 1874-1876; Macvicar (374) 231, figs. 1-3; Sharp, Jour. S. Appalachian Bot. Club 1: pl. near page 49, fig. 4, 1936.

EXAMINATIONS: Tenn. Mt. Le Conte in Sevier County (Sharp) 1935.

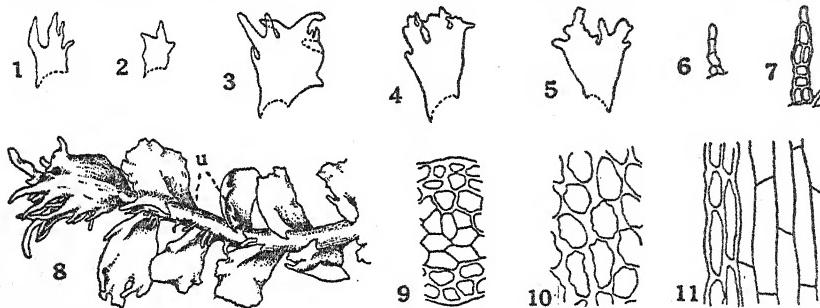
TYPE LOCALITY: British Isles.

RANGE: Tenn. (465.1), N. C. (43); Asia (19.02); Europe (325); Azores (2.075); Canary Isl. (409).

Carrington states that Hooker considered *P. tridenticulata* the male plant of *P. spinulosa* until Taylor found the male shoots of *P. spinulosa* and pointed out how they differed from *P. tridenticulata*. It is therefore uncertain what plant was referred to by those who reported *P. tridenticulata* before Taylor.

3. *Plagiochila caduciloba*⁸⁶ Blom., Bryologist 42:114, 1939.

Plants in depressed mats, light green to reddish brown or rarely dark green; leafy shoots 1.5-2 mm wide. Stems 2 cm or more long, prostrate to slightly ascending, 120-180 μ thick, brittle, irregularly or subdichotomously branched; branches few; cortical cells of the stem in 2 layers, oblong, rectangular, rather shorter and narrower than the interior ones,



Plagiochila caduciloba. 1-2, Leaves from branches, x 17.8. 3-5, Leaves from main shoots, x 17.8. 6-7, Underleaves, x 132. 8, Tip of shoot, ventral view, with underleaves (*u*); most of the lobes lost by the older leaves, x 17.8. 9, Part of cross section of stem, x 178. 10, Cells of the leaf middle, x 178. 11, Part of longitudinal section of stem, x 178. (All after Blomquist.)

with thick walls; the interior cells elongate, with thin walls. Rhizoids scarce. Leaves alternate, quite succubous, with somewhat semicircular insertion, decurrent both dorsally and ventrally, distant to contiguous, erect-spreading to spreading rather horizontally at an angle of 45-75 degrees, unlobed or often somewhat 2-lobed, broadly cuneate, averaging about 1 mm long and 500 μ wide, slightly adaxially convex; apex somewhat rounded to truncate as a whole; margins nearly always entire in lower

⁸⁶ kā dū" sī lō' bā.

$\frac{1}{3}$ - $\frac{1}{2}$ of leaf; dorsal margin moderately long decurrent, often with a single narrow lobe or rarely several lobes, straight to slightly sinuate; ventral margin shortly decurrent, mostly 1-3-lobed, sometimes broadly revolute; margin as a whole from rarely sinuate or crenate to 1-9-lobed; lobes very irregular, sometimes again lobed, the divisions tending to be ciliary, often the primary lobes making the leaf more or less bifid or trifid; secondary lobes early caducous; branch leaves similar to the stem leaves but usually smaller, their 2 or 3 primary lobes not or but little divided. Cells of the leaf middle averaging 24 μ , of the tip averaging 21-25 μ , of the margin somewhat smaller, of the base 25-28 μ ; walls thick, trigones in the leaf middle large to slightly bulging, not rarely confluent. Gemmae unknown, the caducous leaf lobes probably regenerating. Underleaves rudimentary, a single row of cells or partly a double one. Inflorescence and sporophyte unknown. The name from the caducous secondary lobes of the leaves.—On moist rocks or moist soil of bluff.

ILLUSTRATIONS: Blomquist, Bryologist 42:115, figs. 1-19, 1939.

EXAMINATIONS: Tenn. Bullhead on Mt. Le Conte (Sharp 341028) 1934; Chimney's Parking Lot in Sevier County (Sharp 4125) 1941; Tremont in Blount County (Sharp 34603) 1934.

TYPE LOCALITY: Greenbrier, Sevier County, Tennessee (Sharp 3871).

RANGE: N. C. (43.2), Tenn. (43.2).

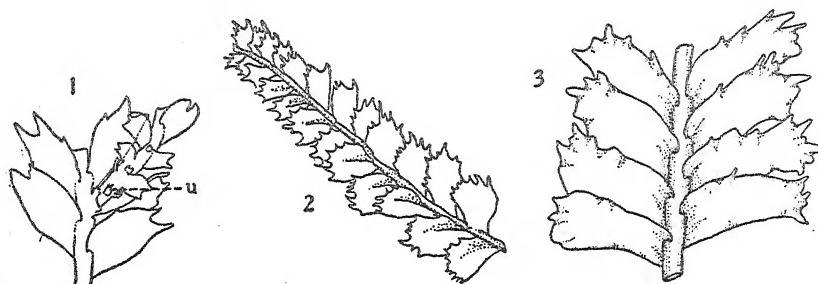
4. *Plagiochila sullivantii*⁸⁷ Gottsche in Evans, Bot. Gaz. 21:191, 1896.

P. spinulosa of Sull. Musci Alleghaniensis Exsic. No. 219. Not of Dum. Rec. d'Obs. 15, 1835 (= *Jungermannia spinulosa* Dicks. Fasc. Crypt. 2:14, 1801).

P. allegheniensis Evans in Steph., Bull. Herb. Boissier, Ser. 2, 3:334, 1903; also Sp. Hep. 2:318, 1903.

Plants in patches, bright green to yellowish green or brownish when old, glossy; leafy shoots 1-2 mm wide. Stems 5-10 mm long, simple or with few branches; branches from ventral half of axil of lateral leaf. Rhizoids few, near base of plant. Leaves alternate, quite succubous, slightly decurrent dorsally, distant to somewhat imbricate, widely and rather horizontally spreading, in some 2 lobes or 2 larger teeth distinguishable at tip; margins entire at base; dorsal one arching or nearly straight, entire to tip, slightly reflexed at base; ventral one much more arching, entire or coarsely toothed from tip more or less toward base and in some leaves as much as $\frac{2}{3}$ the distance toward base; apex distinctly several-toothed; teeth 2-9 in number, coarse, wide, sharply pointed. Cells of the leaves 19-29 μ ; walls thin; trigones minute or small. Gemmae unknown. Underleaves minute, divided to base into several capillary lobes. Plants unisexual. Male plants unknown. Female bracts appressed to the

⁸⁷ súl li ván' ti 1.



Plagiochila sullivantii. 1, Part of plant with branch and underleaves (*u*), $\times 12$. 2, Tip of shoot, ventral view, $\times 8.5$. 3, Part of plant, ventral view, $\times 50$. (1-2, after Evans; 3, after Kurz & Little.)

perianth. Perianth ovoid-cylindric, about $\frac{1}{2}$ -emergent; mouth dentate. Sporophyte unknown. Named in honor of W. S. Sullivant, who first distributed the species.—On banks of streams.

ILLUSTRATIONS: Ammons (3.1) 144, fig. C; Evans, Bot. Gaz. 21: pl. 15, fig. 19, 1896; Kurz & Little, Bull. Florida State College for Women 26(3):34, fig. 50, 1933; Evans, Ann. Bot. 26:28, fig. 35, 1912.

EXAMINATIONS: Fla. Key Largo (McFarlin) 1934; Pensacola (Frye) 1935; Timmes Hammock near Homestead (McFarlin & Grout 1967).—N. C. Andrews Bald in Great Smoky Mts. (Taylor 2039) 1929; Winston-Salem (Schallert) 1923.—Tenn. Sevier County (Sharp 38103) 1938.

TYPE LOCALITY: In forests in Virginia (or West Virginia) (*Sullivant Musci Alleghaniensis* Exsic. No. 219) 1843.

RANGE:⁸⁸ N. H. (140), Vt. (193), Conn. (140), Ohio (94.3), W. Va. (3.1), Va. (3.1), Tenn., N. C. (43), Ga. (3.1), Fla. (337).

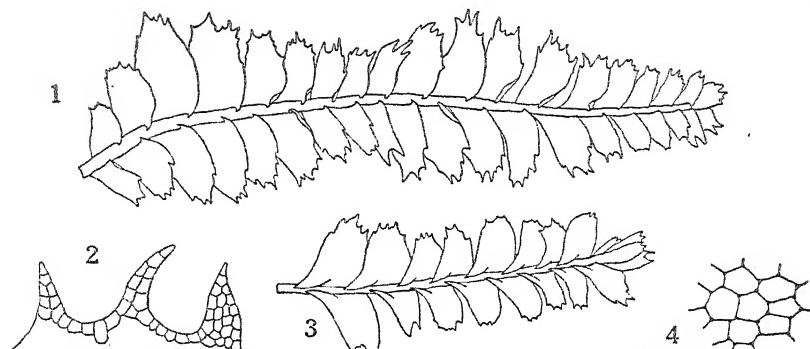
We are uncertain from the meager descriptions of this species and *P. virginica* whether the two are distinct, and we have no material of *P. virginica* to examine. The presence or absence of underleaves is the only described difference to which one could attach much significance.

5. *Plagiochila virginica*⁸⁹ Evans in Millspaugh Fl. West Virginia 497, 1892.

Plants in depressed patches; leafy shoots 1-2 mm wide. Stems 1-3 cm long, ascending from a prostrate rhizomatous base, simple or branched; branches few, sometimes geniculate with the angles on the substratum. Rhizoids only where stems are in contact with the substratum. Leaves alternate, quite succubous but the line of insertion much less than semi-circularly upcurved, dorsally decurrent, contiguous to somewhat imbricate, widely horizontally spreading, some of them somewhat 2-lobed, rounded to truncate at tip, ovate to rhombic-ovate, about 1.2 mm long and 700 μ wide; dorsal margin entire, straight or nearly so, slightly reflexed;

⁸⁸ Since *P. austini* was not recognized until the appearance of Evans' (171) work in 1914, reports of the occurrence of the species before that year leave it uncertain whether the material examined was *P. sullivantii* or *P. austini*.

⁸⁹ vēr' jin' ī kā.



Plagiochila virginica. 1, Shoot, ventral view, $\times 7.7$. 2, Apical teeth of leaf, $\times 87$. 3, Shoot, dorsal view, $\times 7.7$. 4, Cells of the leaf middle, $\times 159$. (All after Evans.)

ventral margin mostly entire, somewhat to rather widely arched, plane or reflexed at base; margin at apex sharply and irregularly spinulose; the spines 2-8 per leaf but usually 4-5, short, acute, the sinuses between the spines rounded. Cells of the leaf middle averaging 23μ ; walls thin; trigones scarcely present. Gemmae unknown. Underleaves wanting. Reproductive organs and sporophyte unknown. The name evidently from West Virginia, the state in which the original collection was made.—On dry limestone walls of cave.

ILLUSTRATIONS: Evans in Millspaugh's Fl. West Virginia, pl. ?, 1892.⁹⁰

EXAMINATIONS: None.

TYPE LOCALITY: Beaver Springs near Mercer, West Virginia (Collector? 1550).

RANGE: D. C. (127.1), W. Va. (127.1).

We do not have access to Millspaugh's Flora of West Virginia of the year 1892. In Millspaugh & Little's Fl. of West Virginia, Field Columbian Mus., Bot. Ser., 1(2):71, 1896, they state they began publishing their work in 1892, but fail to state where. In the 1896 work above (p. 184) this species is described but the figures mentioned as going with the description are not present in the publication of this date. The drawings are reproductions from a photograph of the original plate through the courtesy of the Chicago Museum of Natural History.

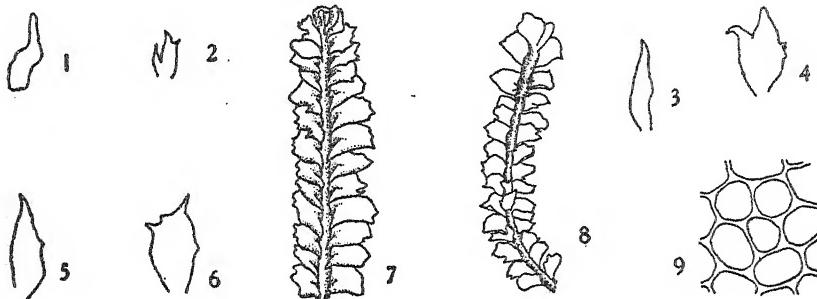
6. *Plagiochila columbiana*⁹¹ Evans, Bot. Gaz. 21:189, 1896.

Plants in loose patches, yellowish green to brownish; normal leafy shoots 1.5-2.5 mm wide. Stem 1.5-3 cm long, ascending, about 400μ in diameter, simple or branched; branches rarely dichotomous, usually pinnate in arrangement. Rhizoids often few. Leaves alternate, quite succulent, shortly decurrent dorsally, contiguous to imbricate, widely horizontally spreading at an angle of about 70 degrees, mostly unlobed but sometimes rather accidentally somewhat 2-lobed, broadly roundish-ovate,

⁹⁰ We have not seen this. If the plate has a number it does not show on the photograph we received.

⁹¹ kō lūm' bī ā' nā.

averaging about 1.6 mm long and 1.1 mm wide; apex truncate, usually with a few scattered teeth; dorsal margin revolute, not or little arched, entire or occasionally with one lobe-like acute tooth; ventral margin not at all decurrent, plane or rarely reflexed, distinctly arched, entire to irregularly 1-3-toothed; margin as a whole with 0-4 teeth. Cells of the leaf



Plagiochila columbiana. 1, Underleaf, small, normal, x 45. 2-6, Underleaves, larger form, x 8.5. 7, Tip of shoot, dorsal view, x 4.2. 8, Tip of shoot, ventral view, x 4.2. 9, Cells of the leaf middle, x 141. (All after Evans.)

middle averaging about 41μ , polygonal; walls rather thick; trigones moderately large. Gemmae unknown. Underleaves scarce, only a few on a stem and present on about one stem out of five, from minute and subulate to larger and lanceolate or ovate, acute, entire to irregularly toothed or lobed. Reproductive organs and sporophyte unknown. The name from Columbia, sometimes used as a synonym for the United States near whose capital city the species was found.—On boulders subject to inundation.

ILLUSTRATIONS: Evans, Bot. Gaz. 21: pl. 15, figs. 1-10, 1896.

EXAMINATIONS: D. C. Rock Creek in Washington (Holzinger) 1892.—N. C. Upper Hope Creek in Orange County (Blomquist) 1932.—Pa. Naaman Falls in Delaware County (D. Robert) 1904.

TYPE LOCALITY: Rock Creek, near Washington, District of Columbia (J. M. Holzinger).

RANGE: Pa., D. C. (127.1), Va.? (3.1), N. C. (43).

7. *Plagiochila austini*⁹² Evans, Rhodora 16:68, 1914.

P. spinulosa of Aust. Hep. Bor.-Amer. Exsic. No. 9, 1873. Not of Dum. Rec. d'Obs. 15, 1835 (= *Jungermannia spinulosa* Dicks. Fasc. Crypt. 2:14, 1801).

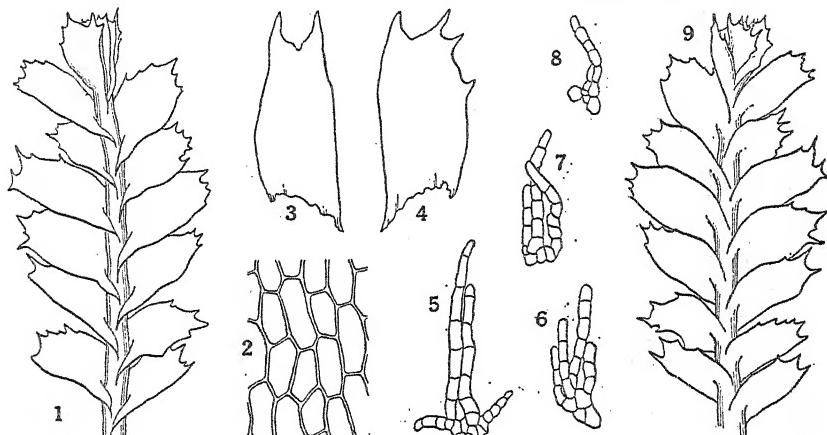
P. sullivanii Evans, Bot. Gaz. 21:191, 1896, in part.

P. sullivanii Steph., Bull. Herb. Boissier, Ser. 2, 3:335, 1903; also Sp. Hep. 2:319, 1903.

Plants in dense patches, green to brownish green; leafy shoots commonly 2-2.5 mm wide, often attenuate toward tip and narrower also

⁹² aw's' tin i.

toward base, many with poorly developed leaves. Stems 8-15 mm long, green, very fragile, branches wanting or few. Rhizoids near base only, not abundant. Leaves alternate, quite succubous, the line of insertion less than semicircularly curved, shortly dorsally decurrent, imbricate, spreading at an angle of about 67 degrees, somewhat horizontal, mostly somewhat 2-lobed or 2-toothed, ovate, mostly averaging 1-1.1 mm long and 330-830 μ wide, nearly symmetric, rounded at tip, but ending usually in 2 more or less distinct lobes or large teeth; dorsal mar-



Plagiochila austini. 1, Part of shoot, dorsal view, $\times 11$. 2, Cells of the leaf middle, $\times 193$. 3-4, Leaves, $\times 26$. 5-8, Underleaves, $\times 114$. 9, Part of shoot, ventral view, $\times 11$. (All original, by Elizabeth Curtis.)

gins almost straight to slightly arching, entire to near tip but occasionally with an additional tooth near tip; ventral margin not decurrent, slightly more arching than the dorsal one, mostly with 1-4 teeth below the tip; margin as a whole with 0-7 but mostly 3-4 teeth; marginal teeth coarse, wide, irregular, usually ending in rather a long acumen; the halves of the leaf when recognizable often unequal, with the ventral more often the larger; reproduction by rejuvenations from caducous leaves. Cells of the leaf middle 27-30 μ , of the apex 17-27 μ , of the base about 27 by 39 μ ; walls somewhat thickened; trigones moderately large. Gemmae unknown. Underleaves present only near tip of stem, small, bifid. Reproduction and sporophyte probably unknown.⁹³ Named in honor of C. F. Austin, who first distributed it.—On shaded rocks.

ILLUSTRATIONS: Evans, Bot. Gaz. 21: pl. 15, figs. 18, 20-21 only, and pl. 16, figs. 1-3 only, 1896; Ammons (3.1) 144, fig. B.

EXAMINATIONS: Tenn. Mt. Le Conte in Sevier County (Sharp 34995) 1934.

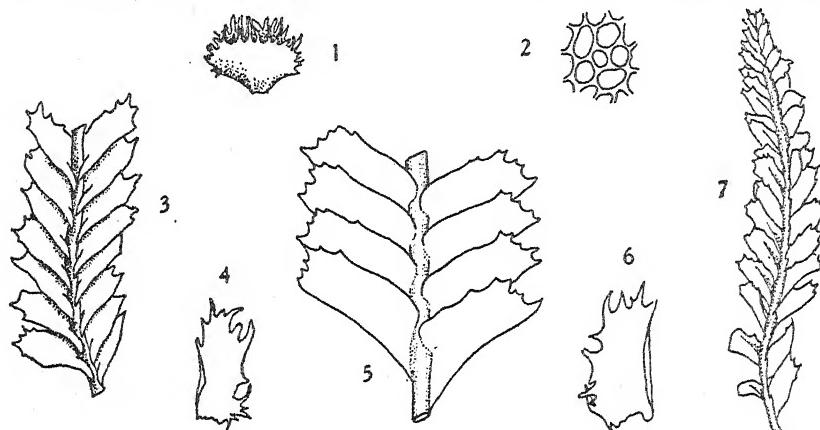
⁹³ Stephani (491) describes the perianth and bracts briefly under the name *P. sullivantii*, but it is doubtful whether the material was this species.

TYPE LOCALITY: Austin, Hep. Bor.-Amer. Exsic. No. 9, 1873, on shaded steep rocks in mountainous regions, probably New York or New Hampshire.

RANGE:⁹⁴ N. H. (171), Conn. (171), N. Y. (171), Pa. (3.1), W. Va. (3.1), Tenn. (464), N. C. (43).

8. *Plagiochila floridana*⁹⁵ Evans, Bot. Gaz. 21:190, 1896.

Plants in loose patches, yellowish green or brownish green; leafy shoots 1.3-2 mm wide. Stems 5-15 mm long, 120-250 μ thick, simple or dichotomously branched. Leaves alternate, quite succubous, decurrent both dorsally and ventrally, imbricate, horizontally erect-spreading at an



Plagiochila floridana. 1, Perianth, young, x 8.5. 2, Cells of the leaf middle, x 141. 3, Part of shoot, dorsal view, x 8.5. 4, Female bract, x 8.5. 5, Part of shoot, ventral view, x 14.1. 6, Female bract, x 8.5. 7, Part of shoot, ventral view, x 8.5. (1-4, 6-7, after Evans; 5, after Kurz and Little.)

angle of 40-45 degrees, some of them more or less bilobed, rectangular or ovate-rectangular, about 1.1 mm long and 400 μ wide, slightly convex adaxially, apex rounded to truncate or 2-lobed, spinose-dentate; dorsal margin decurrent, entire to tip or nearly so, almost straight, plane or somewhat reflexed at base; ventral margin rather long decurrent, entire or more commonly dentate in the upper half, straight to slightly arched, somewhat parallel with the dorsal margin; margin as a whole with 2-5 coarse irregularly spaced teeth; lobes when present acute; sinus shallow, rounded to crescentic. Cells of the leaf middle averaging 23 μ ; walls moderately thick; trigones rather large. Gemmae unknown. Underleaves minute, subulate. Plants unisexual. Male plants unknown. Female inflorescence terminal on a normal leafy shoot, subtended by 1-2 innovations; female bracts about the same size as the leaves of sterile shoots, the mar-

⁹⁴ See comment under *P. sullivantii*.

⁹⁵ flör i dä' nä.

gins more arching, more dentate, the ventral margin spinose-dentate to base or very near it. Perianth known only in immature state, immersed, obovoid, wider than long, not or but narrowly winged; mouth the widest part, coarsely ciliate. Sporophyte unknown. The name from the state in which it was discovered.—On decaying wood.

ILLUSTRATIONS: Evans, Bot. Gaz. 21: pl. 15, figs. 11-17, 1896; Kurz & Little, Bull. Florida State College for Women 26(3):34, fig. 49, 1933.

EXAMINATIONS: Fla. Apalachicola River bluffs (Schornherst 31x) 1939; Mariana in Jackson County (McFarlin 1393) 1934; Sanford (Rapp) 1934; Seminole County (Rapp) 1934; Suwannee River in Suwannee County (Schornherst 604) 1939.

TYPE LOCALITY: Ocala, Florida (L. M. Underwood, Hep. Amer. Exsic. No. 109, under the name *P. ludoviciana*). Ocala is about Lat. $29^{\circ} 21' N.$, Long. $82^{\circ} 8' W.$

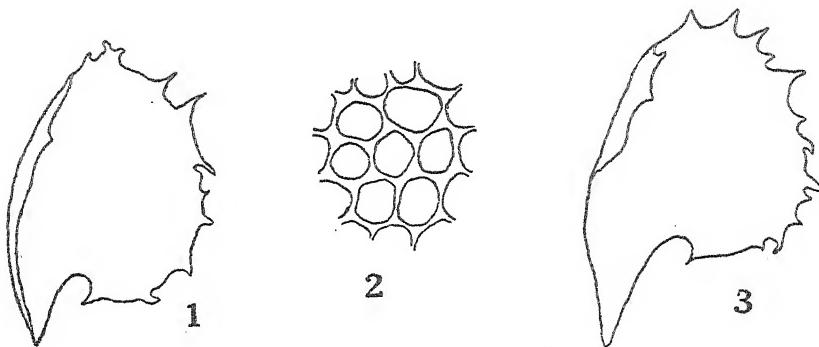
RANGE: Fla. (127.1).

9. *Plagiochila fryei*⁹⁶ Evans, Bull. Torr. Bot. Club 41:593, 1914.

Plants in compact patches, yellowish green to brownish green, not glossy; leafy shoots about 1.5 mm wide. Stems 2-3 cm long, about 150 μ thick, mostly ascending, rigid; branches only occasionally one, intercalary, obliquely spreading, similar to the stems. Rhizoids few. Leaves alternate, quite succubous, the line of insertion semicircular or yet more strongly curved, dorsally and ventrally decurrent, more or less imbricate, spreading at an angle of 45 degrees or less, ventrally secund and often the tips somewhat bent back, not bilobed, orbicular-ovate to orbicular exclusive of the decurrent parts, about 1.4 mm long and 1.2-1.4 mm wide when normal and well developed, more or less adaxially convex, rounded at tip; dorsal margin long decurrent with the decurrent part narrow, entire from the base to the middle or farther, sometimes with 1-3 wide sharp teeth along the upper part, revolute from near base to about the middle or farther, usually distinctly arched; ventral margin with much shorter decurrence, sharply spinose-dentate to near the base, almost plane, almost semicircularly arched and much more strongly so than the dorsal margin, with longer teeth than the dorsal margin; teeth on the leaf margin as a whole mostly 12-15, sharply spinose-dentate, irregular, unequal, pointing in various directions, acute to mostly acuminate; mostly 2-6 cells long and 1-5

⁹⁶ fri'i. It might be pointed out here, where it can be done without hurting the feelings of the collector, that naming species after the one who gathers the plant should be discouraged. While the name may sincerely be given as an honor, it might be given to encourage the collector to send in more material which might yield more new species possibly named in his honor. In the latter case it is more or less of a joke on the collector. The collection of plants is not usually a notable scientific achievement; the perpetuation of unimportant names seems undesirable since it is of no value to science. The recognition of bryophytes ordinarily requires the use of the compound microscope, thus the collector may have his name perpetuated for his ability to gather and mail material.

A new name should bring out an important characteristic, or a habitat, less desirably a geographical location. It should be short and sound well; better short and meaningless than *endiviefolia* or *gymnostomophilum*. Why have we more names of six syllables than of one? In the case of our children we can use nicknames, and the name lasts mostly for a lifetime only; with the names of plants no shortening or changing is allowed when once published.



Plagiochila fryei. 1, Leaf, $\times 24$. 2, Cells of the leaf middle, $\times 309$.
3, Leaf, $\times 24$. (After Evans.)

cells wide at base. Cells of the leaf middle averaging $14\text{--}22 \mu$, near apex about 14μ , near base 14 by 40μ ; walls somewhat thickened; trigones rather large but not sharply limited and not bulging, coalescence frequent especially in the median and basal parts of the leaf; cuticle smooth. Gemmae unknown. Underleaves minute. Reproductive structures and sporophyte unknown. The name from that of the original collector.—On dry base of tree.

ILLUSTRATIONS: Evans, Bull. Torr. Bot. Club 41: pl. 21, figs. 7-9, 1914.

EXAMINATIONS: Alaska. Augustine Bay on Dall Island (Frye 579) 1913, isotype.

TYPE LOCALITY: Augustine Bay, on the west coast of Dall Island, Alaska (T. C. Frye 579) 1913. About Lat. $54^{\circ} 54' N.$, Long. $133^{\circ} 5' W.$

RANGE: Alaska (173). Known only from the type collection.

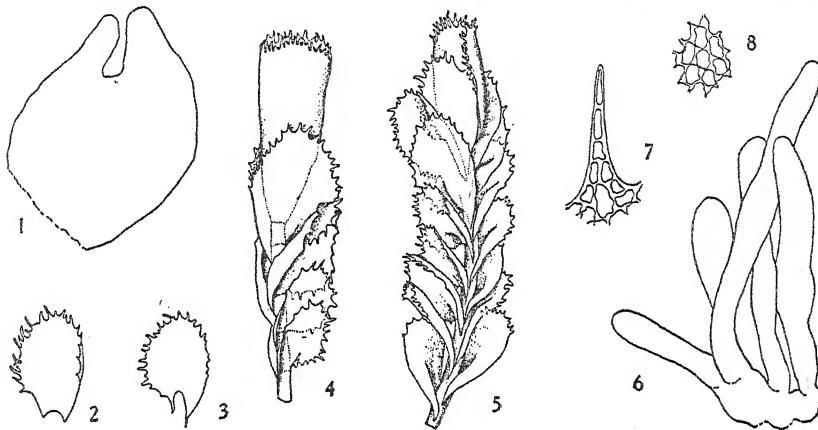
As Evans indicates, the characters distinguishing this from *P. alaskana* are not very convincing. If it proves to have the same reproductive features as *P. alaskana*, *P. fryei* will probably reduce to a synonym or a variety of *P. alaskana*. More collections are needed of both these species.

10. *Plagiochila alaskana*⁹⁷ Evans, Bull. Torr. Bot. Club 41:590, 1914.

Plants in compact tufts, not glossy, yellowish green to brownish green; leafy shoots about 1.5 mm wide. Stems mostly 2-3 cm long, about 150μ thick, ascending, rigid, simple or irregularly branched; branches intercalary, few, obliquely spreading, similar to the stems. Rhizoids sometimes present near the base. Leaves alternate, quite succubous and the line of insertion semicircular or yet more curved, strongly decurrent dorsally and ventrally but more so dorsally, more or less imbricate, erect-spreading at about 45 degrees or less, somewhat ventrally secund, sometimes somewhat ventrally bent back, unlobed, ovate, mostly 1-1.4 mm long from

⁹⁷ à lás kā' nā.

middle of base to tip, mostly about 700μ wide, more or less concave dorsally due to revolute margins; apex rounded; dorsal margin revolute to about the middle of the length of the leaf, straight or usually somewhat arched, entire from base to about the middle, sharply dentate or ciliate-dentate toward tip; ventral margin not revolute, more strongly arched than the dorsal one, more strongly dentate or ciliate-dentate, sometimes a small part near base entire; as a whole with 15-30 teeth but mostly 20



Plagiochila alaskana. 1, Large underleaf, $\times 193$. 2, Female bract, $\times 9.1$. 3, Leaf, $\times 9.1$. 4, Tip of shoot with perianth, lateral view, $\times 9.1$. 5, Tip of shoot with perianth, dorsal view, $\times 9.1$. 6, Small underleaf, $\times 349$. 7, Tooth of margin of leaf, $\times 127$. 8, Cells of the leaf middle, $\times 127$. (1, 6, original, by Elizabeth Curtis; 2-5, 7-8, after Evans.)

to 25; the teeth usually much in the plane of the leaf instead of variously directed, unequal, 3-6 cells long, 1-3 cells wide at base. Cells of the leaf middle $14-21 \mu$, of the apex about 14μ , of the base about 14 by 40μ ; walls more or less thick; trigones large to bulging, frequently coalescent, intermediate ones rare but occurring; cuticle smooth. Gemmae unknown. Underleaves very minute, sometimes divided into several segments, each of which is a single row of cells. Plants unisexual. Male inflorescence unknown. Female inflorescence terminal on a normal leafy shoot, often with 1-2 subfloral innovations; female bracts similar to the leaves, slightly wider than the leaves of sterile stems, about 1.5 mm long and 1 mm wide; the marginal teeth about 25, rather longer than those of ordinary foliage leaves, sometimes reaching 7-8 cells in length. Perianth narrowly obovoid, about 2.7 mm long and 1 mm wide, strongly laterally compressed; keels sharp but wingless, widest at the mouth when mature; mouth large, truncate, densely and sharply ciliate. Sporophyte unknown. The name from its discovery in Alaska.—On logs.

ILLUSTRATIONS: Evans, Bull. Torr. Bot. Club 41: pl. 21, figs. 1-6, 1914.

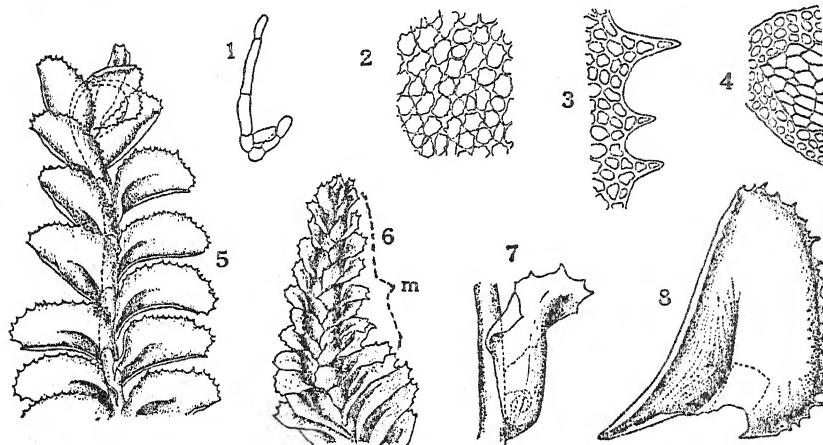
EXAMINATIONS: Alaska. Nichols Bay (Frye 399) 1913; isotype material.

TYPE LOCALITY: Nichols Bay, south end of Prince of Wales Island (T. C. Frye 399) 1913. About Lat. 54° 45' N., Long. 132° 10' W.

RANGE: Alaska (173).

11. *Plagiochila sharpii*⁹⁸ Blom, Bryologist 43:90, 1940.

Plants in dense mats, light green to dark brownish green; leafy shoots about 2.7 mm wide. Stems 2-3 cm long, ascending with the tip curved toward the dorsal side, about 260 μ in diameter, irregularly or sub-dichotomously branched; branches intercalary in origin, few, similar to the stems; cortical cells of stem in about 3 layers, smaller than the interior ones, with very thick walls, rectangular, oblong or shorter; interior cells rather thin walled, quite elongate. Rhizoids scarce, short. Leaves alternate,



Plagiochila sharpii. 1, Underleaf, x 108. 2, Cells of the leaf middle, x 108. 3, Teeth along ventral leaf margin, x 108. 4, Part of cross section of stem, x 108. 5, Part of shoot, ventral view, x 7.8. 6, Tip of shoot, dorsal view, with male inflorescence (m), x 7.8. 7, Male bract, ventral view, x 17.6. 8, Leaf, ventral view, x 17.6. (All after Blomquist.)

quite succubous, with a semicircular insertion, with both margins decurrent, distantly imbricate, erect-spreading or spreading at 60-70 degrees, somewhat horizontal, more or less dorsally secund, oblong-ovate to triangular-ovate, about 1.6 mm long from middle of base to tip, about 1.3 mm wide, strongly adaxially convex with a line of depression from the base to about the middle, apex rounded or rarely truncate, with no indication of bilobing; dorsal margin entire except for 1-4 teeth near tip, slightly

⁹⁸shärp' i i.

arched, more or less recurved to near tip, very long decurrent; the decurrent portion narrow, strongly convex adaxially, with revolute margin; ventral margin dentate to near base with 23 or fewer teeth, strongly arched to rather a wide base, widely recurved, partly arching over the stem; margin as a whole with 18-27 teeth, averaging about 22; the teeth spinose except those near base, irregular, 1-5 cells long but usually 2-3, mostly 2 cells wide at base but a few near apex sometimes 4-5 cells wide; leaves of branches similar to those of the stem. Cells of the leaf middle averaging 17.8 by 24.5 μ , of the margin somewhat smaller, of the middle of the base averaging 17.3 by 51 μ ; walls thick; trigones large to bulging, in the median region of the leaf often making the cell cavity stellate; cuticle smooth. Gemmae unknown. Underleaves wanting to small, the larger often ending in ciliary segments. Plants unisexual. Male inflorescence terminal or less frequently farther down, sometimes branched, rarely with 1-2 subfloral innovations; male bracts smaller than the leaves but similar to them, strongly saccate at base, dentate to nearer the base on the dorsal side than are the leaves; antheridia 4 or fewer. Female inflorescence unknown. Named in honor of A. J. Sharp, of the University of Tennessee, who found it in that state.—On moist face of bluff; on moist rocks.

ILLUSTRATIONS: Blomquist, Bryologist 43:91, figs. 1-12, 1940.

EXAMINATIONS: Tenn. Greenbrier in Sevier County (Sharp 3886) 1938; Ramsey Cascades in Sevier County (Sharp) 1938.

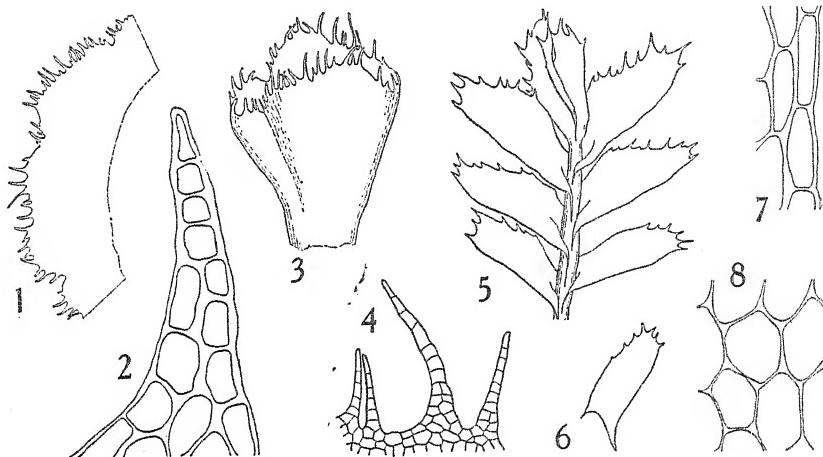
TYPE LOCALITY: Whitewater Falls, Jackson County, North Carolina (L. E. Anderson 6636).

RANGE: N. C. (43.3), Tenn. (43.3).

12. *Plagiochila smallii*⁹⁹ Evans, Bull. Torr. Bot. Club 32:180, 1905.

Plants in loose patches, bright green to dark green; leafy shoots 3-5 mm wide. Stems long, rigid, about 350 μ thick, green to yellowish or reddish green, simple or irregularly to subdichotomously branched; branches oblique, similar to the stem; innovations beneath perianth usually wanting; cortical cells in 3 layers, thick walled, more or less elongate except the epidermal layer; interior cells thin walled, somewhat elongate, colorless. Leaves alternate, quite succubous, the insertion semicircularly curved, decurrent both dorsally and ventrally, distant, horizontally spreading at an angle of 45-60 degrees, mostly with a suggestion of bilobing, narrowly ovate to ligulate, up to 3 mm long and 1 mm wide; apex truncate to rounded or roundly emarginate between the two largest teeth; dorsal margin straight or slightly concavely curved; entire or with 1-2 teeth near tip; plane or narrowly revolute especially near the base; ventral margin straight or slightly convexly curved, with 2-6 teeth along the

⁹⁹ small' i. i.



Plagiochila smallii. 1, Mouth of perianth opened and spread, $\times 16$.
 2, Tooth from tip of leaf, $\times 222$. 3, Perianth, $\times 21$. 4, Part of ventral margin near tip of leaf, $\times 95$. 5, Tip of shoot, dorsal view, $\times 9$. 6, Leaf, $\times 5.6$.
 7, Cells of the leaf base, $\times 222$. 8, Cells of the leaf middle, $\times 222$. (6, after Evans; 1-5, 7-8, original by Elizabeth Curtis.)

apical third of its length, revolute near the base; margin as a whole with 4-9 teeth; the teeth acuminate; the largest teeth in the apical region, 6-10 cells long, 3-7 cells wide, ending in a single row of 2-3 cells; branch leaves similar to the stem leaves, often smaller, usually with fewer and smaller teeth. Cells of the leaf middle averaging 23 by 37 μ , of the margin 16 by 29 μ , of the base 25 by 46 μ ; walls except those of the marginal row thin; trigones moderately large, occasional intermediate ones occurring; cuticle smooth. Gemmae unknown. Underleaves rudimentary. Plants unisexual. Male inflorescence unknown. Female inflorescence terminal on a more or less elongate and normal branch; female bracts similar to the stem leaves, usually a little wider in their basal part, with a few more teeth along the ventral margin, about 2.5 mm long and 1.2 mm wide. Perianth campanulate, about 1.2 mm long and 1 mm thick, before distension by the sporophyte somewhat laterally compressed, with a very narrow entire keel along the base of the dorsal margin; mouth the widest part of the perianth, 2-lipped, the lips each about 20-toothed; the teeth mostly 6-12 cells long and 2 cells wide at base. Sporophyte unknown. Named in honor of Dr. J. K. Small, of the New York Botanical Garden, who was one of the collectors of the type material.—On wet humus and wet rocks.

ILLUSTRATIONS: Evans, Bull. Torr. Bot. Club 32: pl. 5, figs. 1-8, 1905.

EXAMINATIONS: Fla. Goodburn Hammock in Dade County (Small & Mosier 5240) 1915; Hattie Bauer Hammock in Dade County (Small & Mosier 5707) 1915; Miami (Rachel Love 11) 1916.

TYPE LOCALITY: Between Cutler and Camp Longview, southern Florida (Small and Carter 1411), in hammocks near the Homestead trail. About Lat. 25° 37' N., Long. 80° 21' W.

RANGE: Fla. (301); West Indies (428.3); Bermuda Isls. (146).

13. *Plagiochila asplenoides*¹⁰⁰ (L.) Dum. Rec. d'Obs. 14, 1835.

Jungermannia asplenoides L. Sp. Pl. 1131, 1753.

Candollea asplenoides Raddi, Mem. Soc. Ital. Sci. Modena 18:11, 1818.

Jungermannia viticulosa Schweinitz, Sp. Fl. Amer. Hep. 14, 1821. Not of L. Sp. Pl. 1597, 1753.

Radula asplenoides Dum. Comm. Bot. 112, 1822.

Jungermannia poreloides Torr. in Nees Naturg. Eur. Leberrn. 1:170, 1833.

P. poreloides Lindenb. & Gottsche Sp. Hep. 61, pl. 12, about 1839.

Jungermannia dillenii Tayl., Trans. Bot. Soc. Edinburgh 2:316, 1846.

P. nodosa Tayl., London Jour. Bot. 5:268, 1846.

*P. dillenii*¹⁰¹ Tayl., London Jour. Bot. 5:261, 1846.

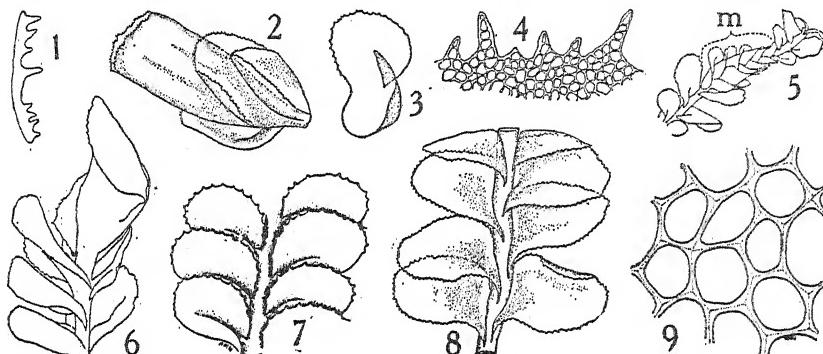
P. poreloides var. *nodosa* Pears., Geol. Nat. Hist. Surv. Canada, Ser. 3, List of Canadian Hepaticae 19, 1890.

Plants in patches or mats, green to dark green; leafy shoots 4-8 mm wide. Stems 2-10 cm long, reddish brown, prostrate with the branches mostly ascending to erect, simple or irregularly branched, the prostrate portion rhizomatous; branches rather numerous, often from beneath the perianth; commonly those from near base flagelliform, at first leafless, bearing rhizoids; cross section of stem with cortex of 3-5 layers of cells; the cortical cells smaller than the interior ones, brownish, with thicker walls. Rhizoids wanting to quite scarce on ascending branches, never common except on rhizomes, colorless. Leaves alternate, quite succubous, the insertion less than a semicircle, decurrent both dorsally and ventrally, mostly contiguous to usually imbricate but distant and small below, spreading to erect-spreading, often horizontal, unlobed, roundly ovate, 2-4 mm long, 1-3.5 mm wide; in adaxial view concave along the median line below, convex toward the dorsal margin; apex rounded, without indication of bilobing; dorsal margin usually entire, sometimes somewhat toothed along its upper part and rarely along its whole upper half, revolute the whole length, nearly straight, long decurrent; ventral margin usually dentate to near base but sometimes entire, not or little revolute, widely arching, shortly decurrent and not leaving two distinct lines of decurrence along the stem; margin as a whole with 0-35 teeth but commonly with about 20, marginal teeth mostly 2-4 cells long and 1-2 cells wide at base. Cells of the leaf middle 30-37 μ , of the margin 22-30 μ , hexagonal; walls thin to slightly thickened; trigones small to bulging; oil bodies 6-12, small; cuticle finely punctate. Gemmae unknown. Under-leaves wanting or present only near the tips of the shoots, minute, subulate or 2-lobed. Plants unisexual. Male plants usually in separate patches;

¹⁰⁰ as plēn" i ô" dēs.

¹⁰¹ Sometimes spelled with one "i." We do not have the original reference to check.

male inflorescence terminal or farther down; male bracts 8-20, smaller than the leaves of sterile shoots, closely imbricate, erect, concave, with spreading tips, about 1.5 mm long and 1 mm wide, usually entire but sometimes denticulate at tip, concave-saccate at base, oblong, with dorsal margin broadly inflated; antheridia 1-3. Female bracts similar to the leaves of sterile stems but wider and irregularly dentate. Perianth oblong or somewhat clavate, 4-7 mm long, 1.6-3.7 mm wide, terete below, laterally compressed above, $\frac{1}{2}$ - $\frac{4}{5}$ -emergent; mouth bent to one side along a



Plagiochila asplenoides. 1, Part of mouth of perianth, x 32. 2, Tip of shoot with perianth, x 3.9. 3, Male bract, x 5.6. 4, Cells along ventral margin of leaf, x 64. 5, Tip of shoot with male inflorescence (m), x 4.4. 6, Tip of plant with perianth, x 4.4. 7, Part of shoot, ventral view, x 3.5. 8, Part of shoot, dorsal view, x 3.9. 9, Cells of the leaf middle, x 200. (1-3, 8, after Pearson; 4, after K. Mueller; 5-6, after Jensen; 7, 9, original, by Helen M. Gilkey.)

diagonal line making it appear to be sloping, irregularly ciliate-dentate. Seta 1.5-5 cm long; in cross section of cells much the same throughout, the epidermal ones 40-50 in number. Sporangium ovoid, about 1.5-2 mm long, purplish brown, its walls about 7 cells thick; epidermal cells large; innermost wall layer of small cells with semiannular thickenings. Elaters 140-200 μ long, 9-14 μ thick; spirals 2, purplish. Spores about 12-24 μ , minutely punctate, reddish brown. The name from *Asplenium*, a genus of ferns, and the Gk. suffix *-oides*, having the form of; from the resemblance to some of these ferns.—On rocks, on logs or trunks of trees, on wet banks, or among other bryophytes.

ILLUSTRATIONS: Pearson (433) 2: pls. 113-114; K. Mueller (409) 1: figs. 338-339; Pearson (431), pl. 11; Hooker (285) pl. 13; Jensen (323.5) 143, 5 figs.; Ammons (3.1) 144, fig. A; Warnstorf (523) 165, fig. 7; Macvicar (374) 223, figs. 1-3; Ekart (124) pl. 1, fig. 4; Steere (485.5) 78, figs. 1-2; Meylan (386) fig. 127, A-D; Gil (76) fig. 247.

EXAMINATIONS: Alaska. Augustine Bay on Dall Island (Frye) 1913.—B. C. Shell Island in Queen Charlotte Sound (Frye 1146) 1913.—Cal. Smith River (Rakestraw) 1936.—Colo. Silverton (Frye 362) 1931.—Ida. Cascade (Frye 110)

1934.—Ind. Turkey Run State Park (Drexler 1152) 1937.—Iowa. Mantour (Conard 216) 1933.—Mich. Cheboygan (Woollett) 1932.—Mont. St. Ignatius (Frye) 1934.—N. H. Thompson Falls in White Mts. (Underwood) 1889.—N. Mex. Glenwood (Rakestraw) 1938.—N. Y. Little Moose Lake in Herkimer County (Haynes) 1903.—Ore. Oregon Caves (Frye 214) 1931.—Pa. Sayre (Barbour) 1900.—Tenn. Mt. Le Conte in Sevier County (Welch 2167) 1933.—Wash. Port Angeles (Frye) 1927.

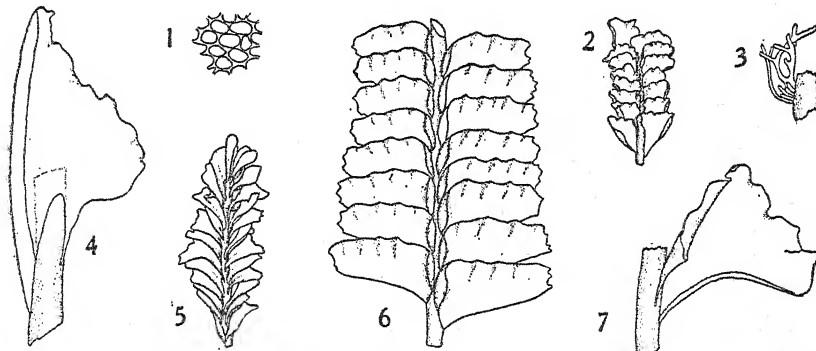
TYPE LOCALITY: European.

RANGE: Greenland (56.01), Melville Peninsula (277.2), Newfoundland (212), Prince Edward Isl. (373), N. S. (413), N. B. (373), Me. (369.1), N. H. (359), Vt. (140), Mass. (7), R. I. (169), Conn. (212), N. Y. (104.1), Que. (178), Pa. (237), Ont. (431), Mich. (419.01), Ind. (512.1), Iowa (88), Wis. (79.2), Minn. (94.1), Mont. (84.2), Alta. (46.2), Alaska (135), B. C. (373), Ida. (84.2), Wash. (81), Ore. (81), Cal. (296), Ariz. (184), N. Mex. (272), Colo. (175), Ga. (428.7), Tenn. (464), N. C. (43), Ky. (218.2), W. Va. (3.1), Va. (127), D. C. (343), Md. (444), N. J. (504); Mex. (224); Asia (19.05); Africa (2.02); Eur. (325).

The species is quite variable and thus often described with numerous varieties and forms. The variations are chiefly in the size of the plant and of its leaves, in the amount of serration of the leaves, and in the abundance of stoloniform branches. These grade into each other so that it seems best to recognize a variable plant rather than a lot of varieties under separate varietal names. The variety *major* is reported from Maine (430.02), var. *minor* from Maine (430.02) and Nova Scotia (53.1), var. *subintegra* from Washington (454).

14. *Plagiochila undata*¹⁰² Sull. *Musci Alleghanienses Exsic.* No. 222, 1845.

Plants yellowish green to brownish; leafy shoots 1.5-3.5 mm wide. Stems 2-3 cm long, 200-300 μ thick, rigid, brownish, simple or with few branches. Leaves alternate, quite succubous, the insertion curved far up the stem in the form of half a rather narrow ellipse; long decurrent both dorsally and ventrally, imbricate, horizontally erect-spreading at an angle of 45 to 58 degrees, without bilobing, triangular-ovate, about 1.9 mm long and 800 μ wide, asymmetric, the ventral half markedly undulate;



Plagiochila undata. 1, Cells of the leaf middle, $\times 106$. 2, Part of shoot, ventral view, $\times 6.5$. 3, Piece of stem with underleaf, $\times 16.9$. 4, Piece of stem with leaf, $\times 16.9$. 5, Tip of shoot, dorsal view, $\times 6.5$. 6, Part of shoot, ventral view, $\times 9$. 7, Piece of stem with leaf, ventral view, $\times 16.9$. (1-5, 7, after Evans; 6, after Kurz and Little.)

¹⁰² ün dä' tå.

apex emarginate to truncate or obtuse to rounded, more or less toothed; dorsal margin nearly straight but somewhat concavely arched, entire, not undulate, reflexed along the whole length, the decurrent part not crest-like in form; ventral margin strongly arched especially near base, entire but apparently sinuate on account of the undulations, somewhat broadly recurved rather than reflexed, the decurrent portion crest-like and entire, the decurrent parts of the leaves in 2 rather distinct lines along the ventral side of the stem; margin as a whole with 1-4 teeth. Cells of the leaf middle averaging about 20μ , of the apex about 18μ , of the base about 18 by 27μ ; walls rather thick; trigones moderately large. Gemmae unknown. Underleaves rudimentary to 2-lobed, the lobes divided into cilia or teeth. Plant unisexual. Male inflorescence unknown. Female inflorescence terminal on a normal leafy shoot; female bracts about 1.7 mm long and 2.6 mm wide, broadly cuneate; the dorsal margin reflexed, denticulate; the ventral margin and apex irregularly dentate. Perianth campanulate, subtended by innovations; about 2 mm long and 2 mm thick, laterally flattened; mouth 2-lipped, ciliate. Sporophyte unknown. The name from *L. undatus*, wavy; in reference to the undulate leaves.—On wet shaded banks, on rocks, and on exposed roots.

ILLUSTRATIONS: Evans, Bot. Gaz. 21: pl. 16, figs. 13-19, 1896; Gottsche (224) pl. 15, 1867, as *P. crispata* may belong here; Kurz & Little, Bull. Florida State College for Women 26(3):34, fig. 47, 1933.

EXAMINATIONS: Fla. Alum Bluff in Liberty County (McFarlin 1531) 1935.—Ga. Toccoa (Underwood & Cook 116) 1891.—Ill. Southern part of state (Drexler 1043) 1936.—Tenn. Lake Calderwood in Blount County (Sharp 397) 1939; Walker's Valley in Blount County (Sharp 1531) 1935.

TYPE LOCALITY: Along Savannah River, Georgia.

RANGE: Ill. (246.7), Tenn., La. (491), Ala. (396), Fla. (337), Ga. (127.1), N. C. (43).

It remains a question whether *P. crispata* Gottsche, De Mexikanske Levermosser, Dansk-Vidensk. Selsk. Skrift 6:167, pl. 15, 1867 is the same as *P. undata*. Evans (127.1) evidently is inclined to think so. Stephani (Sp. Hep. 3:323) a few years later expresses the belief that *P. crispata* is a distinct species differing in the female bracts coarsely and distantly spinose; mouth of the perianth densely spinose with long spines, stem leaves distinctly denticulate at apex. The stem leaves of the Kurz & Little figure (337) are, however, distinctly denticulate at apex and quite different in general appearance from Evans' (127.1) figures. The description of the reproductive features are all based upon Evans' few remarks (127.1) about a single imperfect perianth with the subtending bracts. A full description, with plenty of illustration, of reproducing material is much needed.

15. *Plagiochila ludoviciana*¹⁰³ Sull. Musci Alleghanienses Exsic. No. 223, 1845.

Larger leafy shoots 2.5-3 mm wide. Stems 2-4 cm long, ascending, flexuous, 200-300 μ thick; branches few. Leaves alternate, quite succumbous, the line of insertion semicircularly curved, decurrent both dorsally

¹⁰³ lü" dō vī kí á' nā.

and ventrally, imbricate, widely and rather horizontally spreading, somewhat ovate, about 2.5 mm long and 1.2 mm wide, convex adaxially; apex acute to truncate; dorsal margin long decurrent, entire or with 1-2 teeth near tip, nearly straight to somewhat concavely arched above the decurrent base; ventral margin less decurrent than the dorsal one, with 1-3 teeth on upper part of the wide decurrent portion, more or less irregularly toothed from there to tip, widely arched especially toward the leaf base, plane above the reflexed decurrent portion, the ventral decurrence forming 2 crest-like lines parallel to the stem; margin as a whole with 7-13 teeth of irregular size; rejuvenations from the leaves with small deeply 2-lobed



Plagiochila ludoviciana. 1-4, Underleaves, x 23. 5, Part of shoot, dorsal view, x 8.5. 6, Tip of shoot, ventral view, x 12. 7, Cells of the leaf middle, x 141. 8, Part of leaf with rejuvenations from it, x 23. 9, Part of shoot, dorsal view, x 8.5. (1-5, 7-9, after Evans; 6, after Kurz and Little.)

leaves. Cells of the leaf middle averaging 29 by 21 μ ; walls slightly thickened; trigones moderately large. Gemmae unknown. Underleaves sometimes deeply divided into several ciliary segments, sometimes leaf-like and bifid or irregularly cleft with the margins entire to toothed, commonly with gradations between the above extremes of underleaves. Reproduction and sporophyte unknown. The name from L. *Ludovicia*, the old name for Louisiana, in which state it was first found.—On bark and on wet rocks.

ILLUSTRATIONS: Evans, Bot. Gaz. 21: pl. 16, figs. 4-12, 1896; Kurz & Little, Bull. Florida State College for Women 24(3):34, fig. 48, 1933.

EXAMINATIONS: Fla., Holmes Creek near Bonifay (McFarlin) 1934; Madison (McFarlin 1034a) 1934; Ocala (Underwood & Cook 118) 1891; Rock Bluff (McFarlin 1446) 1934; Sanford (Rapp) 1933; Torreya State Park (McFarlin 1484) 1934.—Ga., Thomasville (Brown) 1923.—Miss., Van Cleve (Pennybaker 38) 1938.—S. C., Charleston (Mrs. J. M. Fox) 1918.—Va., Langley (Chamberlain 128) 1903.

TYPE LOCALITY: Louisiana.

RANGE: Ill. (246.6), La. (498), Miss., Ala. (396), Fla. (337), Ga. (52), S. C., N. C. (43), Va.; West Indies (428.3).

HARPANTHOIDEAE¹⁰⁴

Branches arising in the axils of underleaves. Rhizoids in tufts at the bases of the underleaves. Leaves alternate, quite succubous, somewhat decurrent dorsally, simply 2-lobed; margin entire; lobes acute to rounded, the ventral one usually the larger; sinus acute to crescentic, descending $\frac{1}{2}$ - $\frac{1}{3}$ the leaf length. Cell walls thin. Gemmae rare or unknown. Underleaves present throughout or abundant, well developed, unlobed to 2-lobed. Sexual branches from the axils of the underleaves. Male and female inflorescences constituting each the whole of their respective branches, without normal leaves. Perianth present or wanting. Perigynium more or less fully developed, with rhizoids. Seta in cross section with epidermal cells somewhat larger than the interior ones. Sporangium ovoid or cylindric; its walls 2-4 cells thick.

The short modified sexual branches, mostly ventral, suggest a relationship with the Lophocoleoideae.

- | | |
|--|--|
| Perianth present, clavate; perigynium not well developed, extending little downward, rhizoidous at base only; plants nearly always unisexual; underleaves common, unlobed or lobed more or less deeply near base of shoot.....
Perianth wanting; perigynium well developed, extending deeply downward, rhizoidous to near tip; our plants bisexual; underleaves present throughout, divided to near their base. | <i>Harpanthus</i> , p. 457
<i>Geocalyx</i> , p. 461 |
|--|--|

RELATIONSHIPS AMONG NORTH AMERICAN HARPANTHOIDEAE

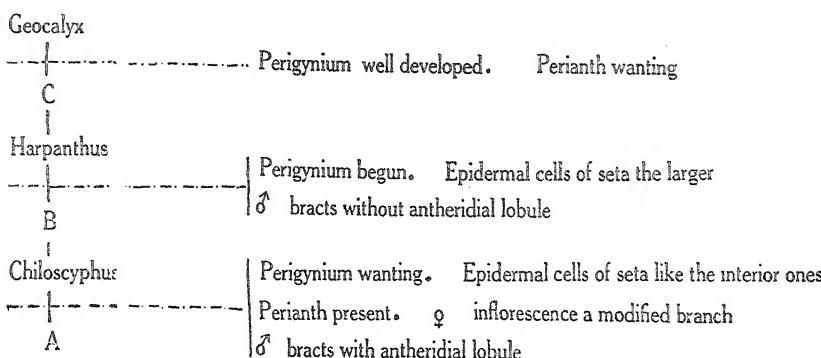
The comments under the letters below are pertinent at the corresponding letters on the opposite page.

(A) Branches arising behind the leaf; male inflorescence on the main shoot or on a modified branch; female bracts smaller than the leaves; rhizoids in tufts; underleaves present throughout, 0-2-lobed; leaves 0-2-lobed.

(B) Branches arising ventrally; male inflorescence a modified branch; female bracts larger than the leaves; underleaves common or present throughout; leaves 2-lobed.

(C) Female bracts about the same in size as the leaves; underleaves present throughout, 2-lobed.

¹⁰⁴ här' pānθ ôt' dā ē



Phylogenetic diagram of North American Harpanthoideae.

HARPANTHUS¹⁰⁵ Nees Naturg. Eur. Leberm. 2:351, 1836.

Branches wanting or ventral, arising in the axils of the underleaves. Rhizoids in tufts at bases of underleaves. Leaves alternate, quite succubous, somewhat dorsally decurrent, broadly ovate, simply 2-lobed; lobes acute to blunt; sinus right-angular to crescentic. Gemmae quite rare. Underleaves comparatively large, lanceolate or 2-lobed, spreading, the apex incurved. Plants unisexual, or rarely bisexual; both inflorescences constituting each a very short ventral branch. Male inflorescences often in pairs, spicate; male bracts few, quite concave; antheridia 1-2 per bract. Female bracts lying closely along the perianth, commonly smaller than the leaves of sterile stems; bracteole inserted above the bracts. Perianth clavate, 3-5-plicate toward tip, united with the lower $\frac{2}{3}$ of the calyptra and the united portion becoming perigynium-like; mouth narrow, with as many lobes as there are plicae, the lobes crenulate with projecting cells. Seta in cross section with epidermal cells somewhat larger than the interior ones. Sporangium broadly ovoid, its wall of 2 layers of cells. Elaters 2-spiral. Spores verruculose or smooth. The name from Gk. *harpe*, a sickle, and *anthos*, a flower; in reference to the curved lower part of the perigynium-like perianth.

Leafy shoots about 1 mm wide; stems 1.5 cm long or less; leaf sinus $\frac{1}{6}$ - $\frac{1}{3}$ the leaf length; underleaf often connate with one of the leaves.....

1. *H. scutatus*.

Leafy shoots 1.7-3 mm wide; stems 2-8 cm long; leaf sinus $\frac{1}{12}$ - $\frac{1}{7}$ the leaf length; underleaf free from the leaves... 2. *H. florovianus*.

¹⁰⁵ här pän' thüs.

1. *Harpanthus scutatus*¹⁰⁰ (Web. & Mohr) Spruce, Trans. Bot. Soc. Edinburgh 3:209, 1845.

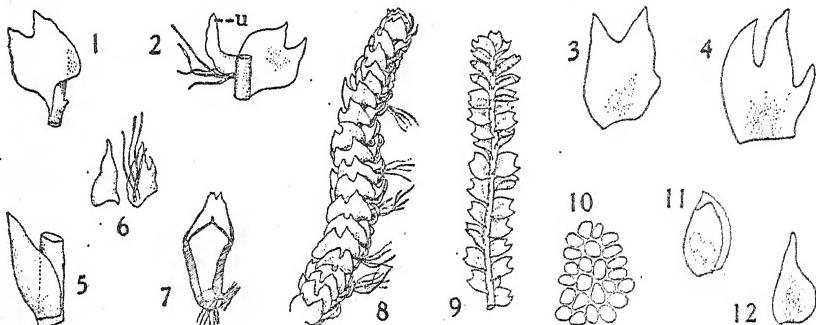
Jungermannia scutata Web. & Mohr Bot. Taschenbuch 408, 1807.

Jungermannia stipulacea Hook. Brit. Jung. pl. 41, 1816.

Lophozia scutata Dum. Rec. d'Obs. 17, 1835.

Odontoschisma scutata Aust. Bot. Gaz. 7:20, 1882.

Plants in small patches, pale green, becoming yellowish or reddish green when dry; leafy shoot about 1 mm wide. Stems up to 1.5 cm long, prostrate with tips ascending, slender, pale green; branches few, ventral, from the axils of the underleaves. Rhizoids rather numerous, colorless, long, present to near tip of the stem, in tufts at the bases of the underleaves. Leaves alternate, quite succubous, dorsally decurrent, approximate to imbricate, suberect to ascending, simply 2-lobed, broadly oval to oval-oblong, about 450 μ long and 400 μ wide, mostly concave; margins entire



Harpanthus scutatus. 1, Leaf, x 13.2. 2, Leaf and underleaf (*u*), x 13.2. 3-4, Female bracts, x 35. 5, Underleaf, x 45. 6, Two underleaves, x 13.2. 7, Longitudinal section of female branch, x about 16. 8, Part of plant, x 13.2. 9, Part of plant, dorsal view, x 8.2. 10, Leaf cells, x 77. 11, Male bract, x 35. 12, Underleaf, x 35. (1-2, 6-8, after K. Mueller; 3-5, 9-12, after Pearson.)

to subsinuate; lobes commonly unequal with the ventral one the larger, acute, often connivent; sinus descending $\frac{1}{5}$ - $\frac{1}{3}$ the leaf length, usually rounded to lunate, sometimes acute or obtuse. Cells of the leaf middle 30-35 μ , of the lobes 20-25 μ , near base 30-40 μ , polygonal, the cell cavity roundish, the marginal row subquadrate; walls thin; trigones small to rather large, distinct; oil bodies 4-8; cuticle smooth or nearly so. Gemmae very rare, on short innovations from both male and female inflorescences, terminal, elliptic, somewhat curved, 2-celled, about 8 by 22 μ , light green. Underleaves comparatively large, 300-350 μ long, 100-125 μ wide, erect-spreading, usually incurved at tip, unlobed or 2-3-lobed, oblong-ovate, acute to obtuse, connate at base with a leaf; margin otherwise entire. Plants unisexual; both inflorescences constituting very short ventral

¹⁰⁰ skū tā' tūs.

branches. Male plants near the female ones or in the same patches; male inflorescence spicate; male bracts smaller than the leaves, about 375μ long and 350μ wide, 6-8, 2-lobed for about $\frac{1}{3}$ the length, quite concave; antheridia 1-2. Female branches with numerous rhizoids ventrally at base; female bracts but little larger than the leaves of sterile stems, about 600μ long and 350μ wide, the lobes acute; bracteole oblong-ovate, acute, free or united with one of the bracts. Perianth ovoid-oblong, bluntly 3-angled above, about 1 mm long and 400μ in diameter, fleshy, somewhat inclined to grow toward the earth basally and thus become somewhat perigynium-like, the upper free part 1 cell thick; mouth somewhat narrowed, 3-5-lobed for about $\frac{1}{3}$ the length of the perianth, the lobes crenulate with projecting cells. Sporangium ovoid, reddish brown, its wall of 2 layers of cells; epidermal cells large, nodular; inner cells of wall smaller, with semiannular thickenings. Elaters about 8μ thick, hardly attenuate; spirals 2, reddish brown. Spores $8-10 \mu$, smooth to granulate, reddish brown. The name the *L. scutatus*, provided with a shield; perhaps in reference to the roundish concave leaves.—On sandstone, on humus, on rotten wood and bark of trees.

ILLUSTRATIONS: Hooker (285) pl. 41; Pearson (433) 2: pl. 107; K. Mueller (409) 1: figs. 358d, and 359; Steere (485.5) 52, figs. 8-12; Ekart (125) pl. 8, fig. 64; Macvicar (374) 252, figs. 1-3; Ammons (3.1) 140, fig. B; Meylan (386) fig. 135 A-B.

EXAMINATIONS: N. Y. Bisby Lake in Herkimer County (Haynes) 1906.—Ohio. Champaign County (Collector?) 1877.

TYPE LOCALITY: Jena, Germany (Floerke).

RANGE: Labrador (510), Miquelon Isl. (431), N. S. (413), N. B. (373), Me. (430), N. H. (359), Vt. (140), Mass. (235), R. I. (169), Conn. (212), N. Y. (194), Que. (178), Pa. (337), Ont. (373), Mich. (485.5), Ill. (529), Wis. (98), Minn. (185), B. C. (390), Tenn. (464), N. C. (12), Va. (271), Ky. (218), W. Va. (2.1); Asia (212); Eur. (325); Spitzbergen (524.3).

In the *Bryologist* 39:124, 1936, Evans has referred Nova Scotia material collected by Miss Margaret Brown to *H. scutatus* var. *uliginosus* (W. & M.) Spruce. This is the only reference we find to this variety. We have been unable to locate the original Spruce publication of the combination. Further we have not found the reference in Weber & Mohr's *Taschenbuch*, 1907, in which one would expect the name *uliginosus* in some pertinent combination.

Stephani refers *Chiloscyphus drummondii* Tayl., London Jour. of Bot. 5:383, 1846, to *Harpanthus florotianus* as a synonym. The description of *C. drummondii*, however, does not fit *H. florotianus*.

The following description of *C. drummondii* is adapted from G. L. & N. Syn. Hep. 709, 1847:

Plants small, in dense tufts or mats, light yellowish green. Stems normally prostrate but the gemmiparous ones ascending and attenuate, branched. Leaves erect-spreading, slightly recurved, 2-lobed, oblong. Gemmae in minute heads, on the ends of stems with leaves decreasing upward to the vanishing point at tip. Under-leaves ovate, acute, connate with both adjacent leaves, almost entire. Female inflorescence constituting a short branch; female bracts scale-like, laciniate. Perianth shortly cylindric, inflated, gibbose at base ventrally, subcompressed at tip; mouth 2-lobed. Collected on bark of trees in North America by Henry Drummond.

The description points to *Harpanthus scutatus* rather than *H. florotianus* on account of (1) the prostrate stems, (2) the presence of gemmae but disagreeing in

the color, (3) the underleaves connate with the leaves but disagreeing in their union with both leaves, (4) the habitat on bark. The 2-lobed mouth may be an error of observation on a compressed perianth.

2. *Harpanthus florovianus*¹⁰⁷ Nees Naturg. Eur. Leberm. 2:353, 1836.

Jungermannia floroviana Nees, Flora 16:408, 1833.

Jungermannia convoluta Hueben. Hep. Germ. 60, 1834.

Jungermannia vogesiaca Hueben. Hep. Germ. 149, 1834.

Lophocolea vogesiaca Nees Naturg. Eur. Leberm. 2:348, 1836.

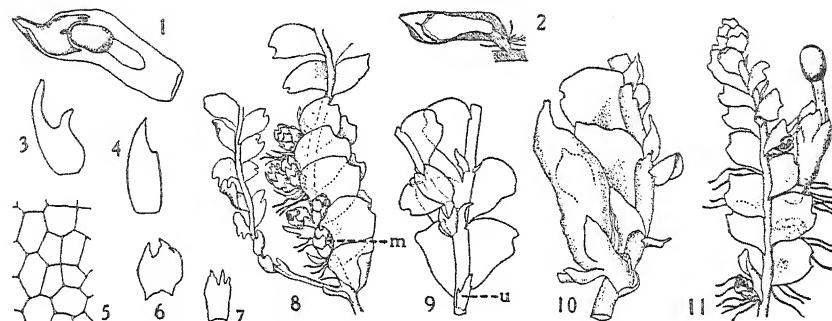
Jungermannia hartmanni Thed. Musci Suecicae, Exsic. No. 138.

Pleuranthe olivacea Tayl. Jour. Bot. 5:282, 1846.

H. florovianus Pears. List Canadian Hep., in Geol. Nat. Hist. Survey Canada, 19, 1890.

Plants in soft tufts or singly among other bryophytes, yellowish green or yellowish brown to reddish, with a fatty lustre; leafy shoots 1.75-3 mm wide. Stems 2-8 cm long, ascending to erect, brown, slender, rigid; branches none or few, nearly all from the axils of the underleaves. Rhizoids numerous, colorless, rather short, in tufts from the bases of the underleaves. Leaves alternate, quite succubous, dorsally decurrent, approximate to imbricate, ascending, horizontal to dorsally subsecund, simply 2-lobed or 2-toothed, roundish-ovate to triangular-ovate, 0.9-2 mm long, 0.6-1.5 mm wide, flaccid; margins entire; lobes unequal with the ventral one the larger, obtuse; sinus descending $\frac{1}{2}$ - $\frac{1}{4}$ the leaf length, rounded to lunate. Cells of the leaf middle 20-40 μ , near the leaf tips 20-25 μ , near the base 30-75 μ , angular, hyaline, the cell cavity rounded; walls thin; trigones wanting to fairly distinct; cuticle smooth. Gemmae unknown. Underleaves large, up to half as long as the leaves, 475-650 μ long, 150-300 μ wide, erect-spreading with the tip incurved, ovate-lanceolate, usually unlobed, entire to sinuate, sometimes with a tooth on one or both margins, sometimes some of those near base of stem 2-lobed up to $\frac{1}{2}$ the length. Plants unisexual; both inflorescences constituting short ventral branches. Male plants usually in separate tufts; male inflorescences shortly spicate, often in pairs; male bracts $\frac{1}{6}$ - $\frac{1}{5}$ as long as the leaves, 4-10, rather closely imbricate, strongly concave, 2-lobed; the lobes acute, incurved at tip; antheridia 1-2. Female bracts much smaller than the leaves of sterile shoots, closely applied to the perianth, deeply 2-3-lobed, very concave; the lobes acute to obtuse, sometimes with an incurved tooth, bracteole ovate-lanceolate, unlobed or 2-lobed to its middle or less, about as large as the bracts, often above the bracts in insertion, spreading. Perianth cylindric or somewhat clavate, 2.5-3 mm long, 0.7-1 mm in diameter, curved below, inclined to become vertical, yellowish green, 3-5-plicate toward tip, somewhat fleshy and perigynium-like but the upper $\frac{1}{3}$ only one cell thick; mouth 3-5-lobed, the number the same as the number of plicae, the lobes crenulate with projecting cells. Calyptra about $\frac{4}{5}$ as long

¹⁰⁷ flō" tō vī ā' nūs. This is the original spelling.



Harpanthus flotovianus. 1, Longitudinal section of fleshy perianth with sporophyte still within the old archegonium, $\times 7.2$. 2, Diagrammatic longitudinal section of female branch and perianth, \times about 4.5. 3-4, Underleaves, $\times 19.1$. 5, Leaf cells, $\times 123$. 6-7, Female bracts, $\times 7.2$. 8, Part of plant with ventral branch and six male inflorescences (*m*), $\times 6.4$. 9, Piece of stem with underleaves (*u*), and ventral branching, $\times 7.2$. 10, Part of plant with short ventral female branch, $\times 7.2$. 11, Shoot with female branch, dorsal view, $\times 6.4$. (1, 3-7, 10, after Pearson; 2, 8, 11, after K. Mueller; 9, after Evans.)

as the perianth and united with it for about $\frac{3}{4}$ the length of the former. Seta about 1 cm long; in cross section 6-7 cells in diameter, epidermal cells about 20 and somewhat larger, interior cells 29-31. Sporangium ovoid, reddish brown; wall 2 layers thick; epidermis with nodular thickenings; inner wall with semiannular thickenings. Elaters about 12μ thick; spirals 2, brown. Spores 9-14 μ , finely punctate, brown. Named in honor of Julius von Flotow, who found the material upon which his friend Nees based this species.—On dirt in moist places, among *Sphagnum*; alpine or subalpine.

ILLUSTRATIONS: Pearson (433) 2: pl. 108; Pearson, Trans. Bot. Soc. Edinburgh 13: pl. 15, 1879; K. Mueller (409) 1: fig. 358, a-c; Underwood (506) pl. 23; Meylan (386) fig. 135, C-E; Macvicar (374) 251, figs. 1-4.

EXAMINATIONS: Alaska. St. Paul Island (Kincaid) 1897.—Mont. Glacier National Park (Frye) 1929.

TYPE LOCALITY: Riesengebirge, a mountain range in Germany (J. von Flotow) June, 1879.

RANGE: Greenland (431), Labrador (510), N. H. (203), Mont. (81), Alta. (46.2), Alaska (135), B. C. (371), Wash. (81); Asia (19.05); Eur. (185); Spitzbergen (325).

GEOCALYX¹⁰⁸ Nees Naturg. Eur. Lebem. 1:97, 1833.

Stems prostrate, simple, or branched from the axils of the underleaves. Rhizoids in tufts at bases of underleaves, also scattered on the perigynium. Leaves alternate, quite succubous, somewhat decurrent dorsally, simply 2-lobed, the margins entire. Gemmae unknown. Underleaves

¹⁰⁸ jē ö kā' līx.

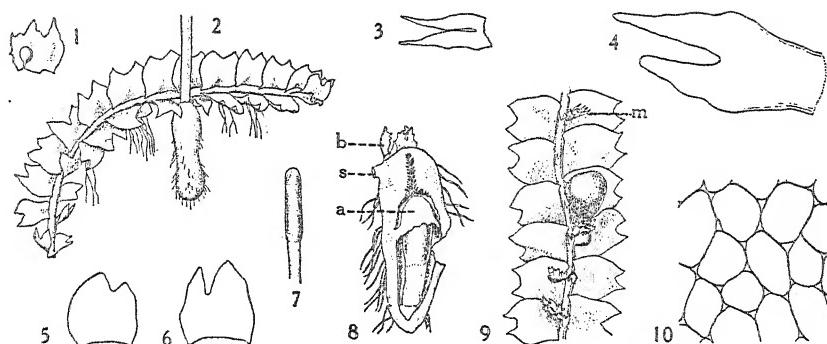
comparatively well developed, present throughout, deeply 2-lobed, sometimes connate on one side with the base of a leaf. Plants unisexual or bisexual; inflorescences each constituting a short ventral branch or occasionally a lateral one. Male inflorescence spicate, in bisexual species near the female branch; male bracts 8-16, shortly 2-lobed; antheridium 1 per bract. Female inflorescence eventually growing into perigynium; female bracts represented by a few small scales. Perianth wanting. Perigynium oblong to cylindric when mature, fleshy, at right angles to the stem, vertical; the outside rhizoidous, with occasional scale-like leaves. Calyptra shorter than the perigynium, for about $\frac{2}{3}$ of its length united with the perigynium. Seta in cross section composed of cells not greatly unlike but the epidermal ones larger. Sporangium elliptic to cylindric, 4-valved to base; valves straight, erect; wall of 2-4 layers of cells; innermost layer of cells with semiannular or annular thickenings. The name from Gk. *ge*, the earth, and *calyx*, a husk; in reference to the perigynium.

1. *Geocalyx graveolens*¹⁰⁹ (Schrad.) Nees Naturg. Eur. Leberm. 2:397, 1836.

Jungermannia graveolens Schrad. Syst. Sammlung Krypt. Gewaechse 2:6, 1797.
Saccogyna graveolens Lindb., Acta Soc. Sci. Fennica 10:509, 1875.

Plants in patches or scattered over mosses, yellowish green or sometimes green, aromatic when fresh; leafy shoots 220-300 μ wide. Stems 0.6-2 cm long, closely creeping, fleshy, brownish green; branches none or usually few, ventral, originating in the axils of the underleaves; in cross section the stem of rather thickly walled cells, the epidermal cells slightly smaller than the interior ones and their walls a little thicker. Rhizoids numerous, colorless, long, in tufts at the bases of the underleaves. Leaves alternate, quite succubous, dorsally slightly decurrent, imbricate, erect-spreading to spreading, from almost horizontal to dorsally secund, simply 2-lobed, quadrate-ovate, 0.8-1.4 mm long, 0.5-1 mm wide at base, firm, somewhat convex; margins entire, the dorsal one nearly straight, the ventral clearly arcuate; lobes broadly triangular, mostly acute, often unequal with the ventral usually the larger; sinus descending $\frac{1}{6}$ - $\frac{1}{3}$ the leaf length, acute to rounded. Cells of the leaf middle 15-20 μ , near the apex 15-35 μ , near the base 20-48 μ , polygonal but the cell cavity rounded; chloroplasts numerous; walls thin; trigones small; oil bodies small, spherical; cuticle minutely punctate. Gemmae apparently unknown. Underleaves much smaller than the leaves, present throughout, narrower than the stem and appressed to it, 2-lobed for $\frac{1}{2}$ - $\frac{5}{6}$ the length, oblong, the margins entire; the lobes nearly parallel, lanceolate-acuminate; the sinus narrow. Plants bisexual. Male branches very short, 0.3-1.2 mm long, spicate, arising below and above the female branches, mostly ventral from

¹⁰⁹ grā vē' ō lēns.



Geocalyx graveolens. 1, Male bract, $\times 12.7$. 2, Shoot with perigynium and seta, dorsal view, $\times 12.7$. 3, Underleaf, $\times 25$. 4, Underleaf, $\times 49$. 5-6, Leaves, $\times 12.7$. 7, Mature unruptured sporangium, $\times 12.7$. 8, Longitudinal section of perigynium with sporophyte still inside old archegonium (*a*), with perigynial shoot (*s*) and female bracts (*b*), $\times 10.6$. 9, Piece of plant, ventral view, with young perigynia and male inflorescences (*m*), $\times 12.7$. 10, Cells of the leaf middle, $\times 193$. (1-3, 5-9, after K. Mueller; 4, 10, original, by Elizabeth Curtis.)

the axes of underleaves, occasional ones from the axes of lateral leaves; male bracts 8-16, imbricate, ventricose, shortly 2-lobed; the dorsal margin with an incurved tooth at base; the lobes acute, incurved; antheridium 1. Female inflorescence on a very short ventral or occasionally lateral branch; female bract small and scale-like. Perianth wanting. Perigynium cylindric when mature, 2.5-3 mm long, about 1 mm thick, with few rhizoids, its mouth with 4-5 small scale-like bracts, these bracts destroyed when the capsule is mature. Seta 0.8-3 cm long; in cross section about 8 cells thick, epidermal cells 16, large; interior cells distinctly smaller, about 31, in 3 layers. Sporangium elliptic or shortly cylindric, 2-5 times as long as thick, brown, its wall 2-4 cells thick; epidermal cells rectangular, with small nodular thickenings on the longitudinal walls; cells of the innermost wall layer little smaller than those of the epidermis, with numerous annular thickenings. Elaters 110-200 μ long, 8-14 μ thick; spirals 2, brown. Spores 8-16 μ , almost smooth, yellowish brown. The name the *L. graveolens*, rank in smell; referring to the aromatic odor of the fresh plant.—In shade; over other bryophytes, on soil or rotten wood.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 360-361; Jensen (323.5) 179, 4 figs.; Macvicar (374) 254, figs. 1-4; Warnstorf (523) 288, fig. 2; Schiffner (458) 93, fig. 51; Meylan (386) fig. 136; Underwood (506) pl. 23; Ammons (2.1) 140, fig. A; Steere (485.5) 52, figs. 6-7.

EXAMINATIONS: Alaska. Snug Harbor in Prince William Sound (Rigg 1222) 1913.—B. C. Lewis Island (Frye 1167) 1913.—Cal. Crescent City (Frye) 1933; Redding (Howe) 1905; Smith River (Rakestraw) 1935.—Mich. Sugar Island in Chippewa County (Steere 3415) 1933.—N. Y. Bisby Lake in Herkimer County (Haynes) 1906; Van Etten (Barbour 7) 1900.—Ore. Estacada (Foster) 1904.—Pa. Sayre

(Barbour) 1900; Upper Susquehanna (Barbour 30) 1900.—*Wash.* Eagle Gorge (Frye) 1921; Lake Merrill in Cowlitz County (Rakestraw) 1936; Olympic Hot Springs (Svihla 97) 1930; Stevens Pass (Rakestraw) 1934.

TYPE LOCALITY: Harz Mountains, Germany (Schrader).

RANGE: Labrador (3.1), Anticosti (431), Miquelon Isl. (373), N. S. (3.1), N. B. (369), Me. (430), N. H. (359), Vt. (203), Mass. (232), R. I. (150), Conn. (212), N. Y. (258), Que. (373), Pa. (337.09), Ont. (373), Ind. (512.1), Mich. (213), Ill. (246.5), Wis. (94), Minn. (94.1), Alta. (46.2), Yukon (298), Alaska (173), B. C. (373), Ida. (218.1), Wash. (81), Ore. (457), Cal. (84.1), Tenn. (464), N. C. (43), Ky. (3.1), W. Va. (3.1), Va. (127), Md. (444), D. C. (343); Asia (350); Eur. (325); Azores (207).

ODONTOSCHISMOIDEAE¹¹⁰

Stems creeping, with ascending to erect tips and branches; branches ventral or also occasional lateral ones. Rhizoids not in distinct tufts. Leaves alternate, succubous and often quite strongly so, unlobed, or occasional leaves shortly 2-lobed; margins entire, unbordered or with 1-4 rows of different cells. Trigones large, mostly greatly bulging into the cell cavity. Gemmae 1-2-celled. Underleaves usually minute, sometimes well developed, often with marginal slime papillae. Plants unisexual. Sexual branches short, usually ventral, rarely lateral. Female branch without normal leaves. Perianth bluntly 3-angled. Setae in cross section composed of cells all about the same in size, the epidermal row of 8-9 cells, the interior of 4 cells. Sporangium ovoid, its wall 2 cells thick.

For relationships, see the diagram, page 476.

ODONTOSCHISMA¹¹¹ Dum. Rec. d'Obs. 19, 1835.

Pleuroschisma section *Odontoschisma* Dum. Syl. Jung. Eur. 68, 1831.

Sphagnoecetis Nees, in G. L. & N. Syn. Hep. 148, 1845.

Cephalozia subgenus *Odontoschisma* Spruce, On Cephalozia 59, 1882.

Plants light green to dark red or brown. Stems creeping, with ascending to erect tips and branches, not from a rhizomatous base, more or less branched, with ventral flagella; branches mostly ventral but in some species lateral branches present. Rhizoids scarce to moderately numerous, not distinctly grouped, short. Leaves alternate, succubous to almost horizontal, not or hardly decurrent, unlobed to occasional leaves shortly 2-lobed, rotundate or a little wider to shortly oblong, more or less concave; apex rounded to retuse or on rare leaves notched to $\frac{1}{3}$ the leaf length; margin entire except for terminal lobing, unbordered to rather clearly bordered with different cells, the border when present 1-4 cells wide. Cells of leaves with large trigones, in most species bulging well into the cell cavity, the walls between trigones either thin or in the border thick; cuticle smooth to minutely papillose or minutely verruculose. Gemmae unknown in some species, usually on erect shoots with small erose leaves and underleaves, 1-2 celled, with thin or thick walls. Underleaves usually minute to well

¹¹⁰ ὁ δῶν "τὸ σκισ μῶν" δέ ε.

¹¹¹ ὁ δῶν "τὸ σκισ μᾶ. We have drawn heavily upon Evans' account of the genus in Bot. Gaz. 36: 321-348, pls. 28-30, 1903. It is the best we have seen.

developed especially toward stem tips, in some species short-lived, often with slime papillae; the slime papillae on the margin and sometimes on the abaxial surface, sometimes present only on young leaves. Plants unisexual. Male inflorescence on short ventral branch, or in some species occasionally on short lateral branch; male bracts smaller than the leaves of sterile stems so far as known. Female inflorescence on short modified ventral branch, or in some species occasionally on lateral branch; female bracts usually 2-lobed or rarely 3-lobed, larger than the leaves of sterile stems; bracteole usually large, about equaling the bracts, 2-lobed. Perianth

ODONTOSCHISMA	1 <i>sphagni</i>	3 <i>prostra-tum</i>	4 <i>elonga-tum</i>	2 <i>denud-atum</i>	6 <i>mac-ounii</i>	5 <i>gibb-siae</i>
1. Trigones not, hardly or greatly bulging.....	h-G	G	G	h-G	N-h	N
2. Sterile branches ventral or lateral.....	1-V	1-V	1-V	1-V	V	V
3. Leaf border wanting, or the width in number of cells indicated.....	w	w	w	w-1	1-2	1-4
4. Plants green, yellowish, brownish, reddish, purplish, blackish.....	ng-pg	yg-n-r	g-rn	yn-p-k	g-N	G-n
5. Leaves about as long as wide, or distinctly longer.....	A-1	A	A	A-1	A	a-L
6. Slime papillae of underleaves marginal, abaxial, on young leaves only, on old leaves also.....	mo	mo	my	(m+a)o	m(Y-o)	(m+a)o
7. Plants on rotten wood, banks or rocks, in swamps or among Sphagnum.....	w-k	w-k	w-k-s	s	s	w-k-s
8. Gemmiparous branches wanting, rare, often abundant.....	a	a	a	r	w	w
9. Leaves slightly or distinctly concave.....	d	d	s	s	s	s
10. Leaves and underleaves of gemmiparous shoots squarrose.....	-	-	+	-	-	-
11. Leaves strongly dilated at ventral base..	-	+	-	-	-	-
12. Cells of the leaf middle, in μ	28	19	20-28	20-25	20-25	20
13. Female branches ventral or lateral.....	V-1		V	V-1	V	V
14. Male branches ventral or lateral.....	V-1		V		V	V
15. Leaves roundish, or clearly longer than wide.....	R-1	R	R	R-1	R	r-L
16. Leaves unnotched, retuse, or more deeply notched.....	u-r	u	u-r	u	u	u-d

NOTE: Capitals in the comparison indicate the usual condition.

large, bluntly 3-angled, more than 1 cell thick below, contracted to mouth; mouth various as to margin, rarely nearly entire. Calyptra thin. Setae in cross section composed of 8-9 epidermal cells and 4 interior ones, all the cells about equal in size and thick walled. Sporangium exserted, ovoid, the valves extending to base, the wall of 2 layers of cells; epidermal cells with nodular thickenings on some of the longitudinal walls; inner wall cells with numerous semiannular thickenings. Elaters with 2 spirals. Spores punctate or papillose to verruculose. The name from Gk. *odus*, tooth, and *schisma*, a split; in reference to the mouth of the perianth in most species.

O. portoricense Steph., known from Cuba and Puerto Rico, would run in the key more nearly to *O. prostratum* than to any other of ours. It would not be astonishing to find it in southern Florida, and *Odontoschisma* from Florida and other Gulf states should be determined with this species as a possibility. Good descriptions and figures are given by Evans (Bot. Gaz. 36:342, 1903). The larger leaves of *O. portoricense* are about twice as long as wide, and its branches are partly of lateral and partly of ventral origin. It has a fairly distinct border 1-4 cells wide.

1. *Odontoschisma sphagni*¹¹² (Dicks.) Dum. Rec. d'Obs. 19, 1835.

Jungermannia sphagni Dicks. Pl. Crypt., Fasc. 1:6, 1785.

Pleuroschisma sphagni Dum. Syll. Jung. Eur. 68, 1831.

Sphagnoecetis communis var. *vegetior* Nees, in G. L. & N. Syn. Hep. 149, 1845.

O. sphagni var. *europea* Spruce, Jour. Bot. 5:157, 1876.

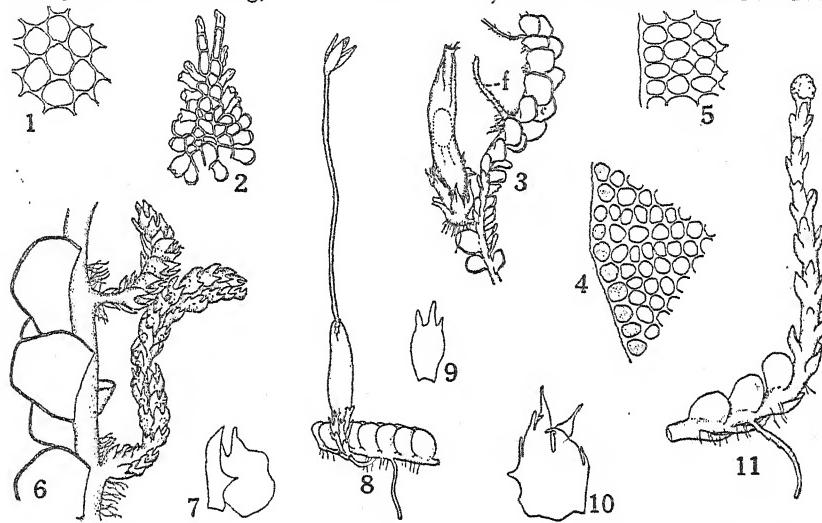
Cephalozia sphagni Spruce, On Cephalozia 60, 1882.

Cephalozia sphagni var. *europea* Spruce, Hep. Amazon et Andes 401, 1885.

Plants in patches or scattered, green to reddish brown. Stems 2-8 cm long, prostrate, without gemmiparous branches, with flagella, simple or branched, flexuous; sometimes with small leaf-like paraphyllia on the ventral side; flagella several; branches ventral, few. Rhizoids numerous, colorless. Leaves alternate, quite succubous, not or hardly dorsally decurrent, contiguous to loosely imbricate, spreading, dorsally secund, unlobed, broadly oval to roundedly ovate, 600-750 μ long and wide, plane or little concave; apex rounded to truncate; margin entire, bordered by 1-2 rows of different cells. Cells of the leaf middle 20-25 μ , of the base about the same; walls rather thin between trigones; trigones large, not or very little bulging, the cell cavity therefore roundish; cuticle finely punctate. Cells of the border roundish to transversely elliptic, sometimes larger or smaller than those adjacent to the border, with thick walls and less distinct trigones. Gemmae wanting. Underleaves wanting on old stems, usually present on young parts, inconspicuous, small, present in both inflorescences, with slime papillae on the margins at least when young. Plants unisexual. Male plants in separate patches; male inflorescence a short ventral branch; male bracts imbricate, about $\frac{1}{3}$ as long as leaves of normal sterile shoots, almost transversely inserted, wider than long, ven-

¹¹² sfäg' n.t.

tricose, 2-lobed to about $\frac{1}{2}$ the bract length; the lobes acute, the dorsal one often with one tooth; male bracteole elliptic, sinuate-dentate to slightly 3-lobed; antheridium 1. Female inflorescence on a short modified ventral branch; female bracts 1.5-2 times as long as the leaves of sterile shoots, ovate, 2-lobed to about $\frac{1}{3}$ the bract length; the lobes triangular, acuminate, with additional teeth on margins of lobes or of the bract below the lobes; the sinus acute; female bracteole 2-lobed for $\frac{1}{3}$ - $\frac{1}{2}$, both sinus and lobes narrow and acute. Perianth cylindric to fusiform, $\frac{3}{4}$ - $\frac{7}{8}$ emergent, 4-5 mm long, 3 cells thick at base, 2 cells thick from the middle



Odontoschisma sphagni. 1, Median leaf cells, x 185. 2, Underleaf, x 132. 3, Part of plant with perianth and flagella (f), x 5.3. 4, Cells along margin of leaf, x 106. 5, Cells along margin of leaf, x 185. 6, Part of plant with 2 male branches, x 10.6. 7, Male bract, x 21. 8, Part of plant with sporangium, x about 4. 9, Male bracteole, x 21. 10, Female bract, x 10.6. 11, Gemmiparous tip of plant, x about 5. (1-2, 5, after Evans; 8, 11, after Hooker; the others after K. Mueller.)

up, 3-plicate above, gradually and not greatly narrowed to the mouth; mouth $\frac{1}{3}$ - $\frac{1}{2}$ the diameter of the perianth, lobed or denticulate, ciliate, the cilia 1-3 cells long. Setae long. Sporangium oval, brown; the wall of 2 layers of cells; epidermal cells with nodular thickenings; inner wall layer with semiannular thickenings. Elaters about 10μ thick; spirals 2, reddish brown. Spores $10-14 \mu$, densely verruculose, reddish brown. So named because it grows among *Sphagnum*.—It has been found only among *Sphagnum*.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 61; Pearson (433) 2: p. 65; Hooker (285) pl. 33 (the branched "root" in fig. 4 is probably a flagellum); Ekart (124) pl. 6, figs. 43, 48; Macvicar (374) 305, figs. 1-4; Evans, Bot. Gaz. 36: pl. 19, figs. 39-41, 1903; Meylan (386) fig. 151; Jensen (323.5) 195, 3 figs.; Warnstorff (523) 1: 245, fig. 3; Gil (76) fig. 285; Garjeanne, Ann. Bryologici 1: 79-88, figs. 1-9, 1928.

EXAMINATIONS: La. Lake Charles (Frye) 1931.—Miss. Biloxi (Frye) 1931.

TYPE LOCALITY: Near Croyden, England (Dickson).

RANGE: Greenland (325), Miquelon Isl. (431), N.S. (413), Mass. (456), N.Y. (299), Que. (84.2), Ont. (373), Ohio (504), Ill. (396), Mont. (84.2), Alta. (51.11), Yukon (373), Alaska (298), La. (396), Miss., Fla. (396), Tenn. (396), W.Va. (386.5), Va. (332), D.C. (282), N.J. (506); S. Amer. (476); Africa (476); Eur. (329).

The plant was not clearly distinguished from *O. denudatum* by early American authors, so material named before 1903, when Evans (104.1) published on the genus, needs redetermination.

2. *Odontoschisma denudatum*¹¹³ Nees, Dum. Rec. d'Obs. 19, 1835.

Jungermannia denudata Nees in Mart. Fl. Crypt. Erlangensis, xiv, 1817.

Jungermannia scalaris var. *denudata* Mart. Fl. Crypt. Erlangensis 183, 1817.

Pleuroschisma denudatum Dum. Syll. Jung. Eur. 69, 1831.

Sphagnoecetis communis var. *macrion* Nees in G. L. & N. Syn. Hep. 149, 1845.

Sphagnoecetis huebneriana Rabenh. Deutsch. Krypt.-Fl. 2:338, 1848.

O. huebneriana Aust. Hep. Bor.-Amer. Exsic. No. 61b, 1873.

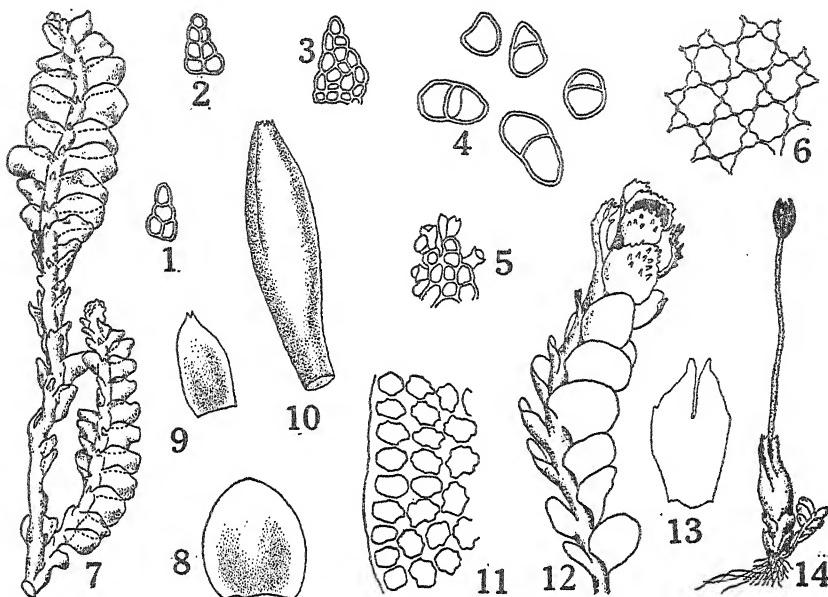
Cephalozia denudata Spruce, On Cephalozia 61, 1882.

O. sphagni var. *denudatum* Massal. & Carest., Nuovo Giorn. Bot. Ital. 14:238, 1882.

O. sphagni var. *macrion* Meylan, Bull. Herb. Boissier, Ser. 2, 1:629, 1901.

Plants in patches, green to reddish brown. Stems 1-2.5 cm long, prostrate and almost leafless below, erect above, with or without branches, with flagella; flagella mostly from near base, ventral; branches ventral or occasional ones lateral, small-leaved and gemmiparous at tip. Rhizoids numerous on base of stem and of flagella, very few above, colorless. Leaves alternate, distinctly succubous, not or hardly decurrent dorsally, contiguous to imbricate, erect-spreading to spreading, unlobed or hardly 2-lobed, roundish to broadly oval, slightly concave, not bordered by different cells; apex rounded to retuse; margin entire, the dorsal one sometimes incurved. Cells of the leaf middle 20-28 μ , of the margin and of the base about the same; walls thick with thinner spots from each cell to each of its adjacent ones; trigones very large, bulging well into the cell cavity so the cavity is sinuous to stellate; cuticle papillose. Gemmiparous branches erect; gemmae common, in groups, numerous, on the tips of the branches and the margins and surfaces of the upper leaves and underleaves, spherical to ellipsoid, 1-2-celled, yellowish green, thin walled, 14-24 μ . Underleaves common but usually disappearing toward base, large as the leaves toward the apex of the stem, erect-spreading, quadrate to oval or lanceolate, the larger 2-lobed, without slime papillae except on the margins of very young ones. Plants unisexual; both inflorescences on short ventral branches. Male bracts transversely inserted, imbricate, 2-lobed, the lobes acute, the sinus shallow. Female bracts broadly ovate, about 1½ times as long as the larger sterile leaves, 2-lobed for about ⅓ their length, united with each other at base, sinuate to sparingly dentate, lobes and sinus acute; bracteole united with both bracts at base. Perianth narrowly fusiform, about ¾-emergent, plicate above, gradually narrowed

¹¹³ dē nū dā' tūm.



Odontoschisma denudatum. 1-3, Underleaves, $\times 124$. 4, Five gemmae, $\times 395$. 5, Underleaf, $\times 176$. 6, Median leaf cells, $\times 267$. 7, Part of plant, ventral view, gemmiparous at tips, $\times 10.6$. 8, Leaf, $\times 17$. 9, Female bract, $\times 17$. 10, Perianth, $\times 17$. 11, Marginal leaf cells, $\times 198$. 12, Gemmiparous tip, $\times 14$. 13, Female bract, $\times 14$. 14, Female inflorescence, with sporangium, $\times 5.6$. (1-3, after Jensen; 4, 12-14, after K. Mueller; 5-6, after Evans; 7, after Steere; 8-10, after Pearson; 11, after Ammons.)

to mouth; mouth rather large, $1/3$ - $1/2$ the diameter of the perianth, crenulate to denticulate. Setae 6-7 mm long. Sporangium ellipsoid. Elaters 8-10 μ thick; spirals 2, reddish brown. Spores 8-10 μ , densely verruculose, reddish brown. The name the L. *denudatum*, denuded; in reference to the more or less bare lower part of the stems.—On rotten wood; on sandstone.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 63; Pearson (433) 2: pl. 66; Meylan (386) fig. 152; Macvicar (374) 307, figs. 1-7; Evans, Bot. Gaz. 36: pl. 19, figs. 35-38, 1903; Jensen (323.5) 195, 5 figs.; Warnstorff (523) 1:245, fig. 2; Kurz & Little, Bull. Florida State College for Women 26(3): figs. 64, 67, 1933; Steere (485.5) 78, figs. 3-5; Ammons (3.1) 135, fig. C.

EXAMINATIONS: Que. Marten River (Lepage 4343) 1943.

TYPE LOCALITY: European. Erlangen is about Lat. $49^{\circ} 34' N.$, Long. $10^{\circ} 39' E.$

RANGE: Greenland (320), Miquelon Isl. (373), N. S. (53.2), N. B. (140.1), Me. (369.1), N. H. (203), Vt. (140), Mass. (235), R. I. (169), Conn. (212), N. Y. (64), Que. (178), Ont. (431), Pa. (237), Ohio (396), Mich. (283), Wis. (226), Ky. (218.2), Tenn. (264), La. (409), Ala. (504), Fla. (337), Ga. (271), N. C. (10), Va. (140.1), W. Va. (2.1), D. C. (282), Md. (444), Del. (140.1), N. J. (140.1); Puerto Rico (428.3); Mex. (224); S. Amer. (476); Asia (409); Eur. (409).

Reports of American localities before the publication of Evans' article on the genus (140.1) in 1903 should be questioned until the material is re-examined.

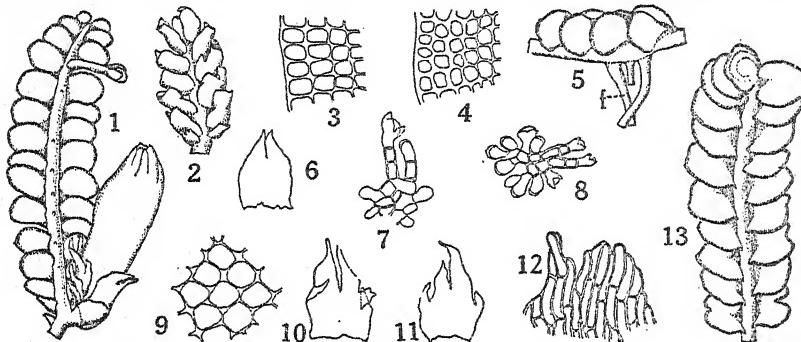
3. *Odontoschisma prostratum*¹¹⁴ (Sw.) Trev., Mem. R. Istit. Lomb. 3(4) :419, 1877.

Jungermannia prostrata Sw., Prodr. Fl. Ind. Occid. 142, 1788.

Sphagnoecetis prostrata G. L. & N. Syn. Hep. 149, 1845.

Pleuroschisma prostratum Mitt., Challenger Repts. Bot. 1(2) :92, 1884.

Plants in mats or creeping among other bryophytes or bog plants, pale green to brownish or reddish green. Stems prostrate with ascending tips, 250 μ thick, irregularly branched; branches usually ventral, few. Rhizoids scarce. Leaves alternate, distinctly succubous, not to slightly decurrent dorsally, distant to loosely imbricate, spreading to horizontally spreading, unlobed to 2-lobed, roundish to shortly oblong, plane to slightly concave, 0.7-1.4 mm long, 0.75-1.3 mm wide; apex rounded to 2-lobed; margin entire, distinctly bordered, the ventral margin little more convex than the dorsal one; lobes rounded at tip, entire; sinus wanting to $\frac{1}{3}$ the



Odontoschisma prostratum. 1, Part of plant with perianth, ventral view, x 9.5. 2, Male inflorescence, dorsal view, x 21. 3-4, Marginal leaf cells, x 132. 5, Part of stem with flagella (f), x 9.5. 6, Female bracteole, x 9.5. 7, Young underleaf, x 132. 8, Underleaf, x 132. 9, Median leaf cells, x 185. 10-11, Female bracts, x 9.5. 12, Part of mouth of perianth, x 132. 13, Part of plant, dorsal view, x 9.5. (All after Evans.)

leaf length deep, acute to rounded. Cells of the leaf middle about 20 μ ; of the margin about 14 by 23 μ , forming a border of 1-4 rows of different cells, these border cells more angular and with thick walls; basal cells about 20 μ ; walls thin except in the border; trigones moderately large, not bulging into the cells, leaving the cell cavity roundish; cuticle somewhat thickened, smooth to minutely verruculose. Gemmae unknown. Underleaves more or less persistent but short-lived, linear to subulate, about 150 μ long and 50 μ wide, shortly bifid at apex, with slime papillae on the margin and sometimes on the abaxial surface. Plants unisexual. Male branch ventral, short, modified; male inflorescence forms whole branch; male bracts about 12, shortly bifid, the lobes and sinus obtuse, commonly with a short and often incurved tooth about the middle of the dorsal margin, inflated near the dorsal base; antheridium 1. Female branch ventral,

¹¹⁴ prós trá' tūm.

short, modified; female bracts ovate, about 1 mm long and 500 μ wide, 2-lobed to about $\frac{1}{2}$ the length, the margin entire or with 1-2 slender lobe-like teeth below the middle, the lobes acuminate, the sinus narrow; bracteole larger than the underleaves on sterile stems, ovate, more or less distinctly bifid, the lobes subulate. Perianth cylindrical-ovoid, about 3 mm long and 900 μ wide, slightly contracted at base and at apex, obtusely 3-ridged in the lower part at least when young, plicate above, acutely contracted to the mouth; mouth $\frac{1}{4}$ - $\frac{1}{3}$ the diameter of the perianth, irregularly lobed, the lobes subentire to shortly setulose, the setae rarely more than 1 cell long. Sporangium ovoid. Elaters about 9 μ thick; spirals 2. Spores about 12 μ , minutely verruculose. The name the L. *prostratus*, prostrate; in reference to the usual position of the plant.—In bogs or swamps; on sandy banks or rocks; on rotten logs.

ILLUSTRATIONS: Evans, Bot. Gaz. 36: pl. 19, figs. 42-54, and pl. 20, figs. 55-64, 1903; Ammons (3.1) 135, fig. D; Kurz & Little, Bull. Florida State College for Women 26(3): figs. 63, 68, 1933.

EXAMINATIONS: Fla. Bristol in Liberty County (McFarlin 1493) 1937; Pensacola (Frye) 1935; Sanford (Rapp 36) 1916.—N. C. Pinehurst in Moore County (Haynes) 1905; Southern Pines in Moore County (Haynes) 1905; White Lake in Bladen County (Anderson) 1932.—Wyo. Dinwoody Wilderness (Temple Clayton 762) 1930.

TYPE LOCALITY: Jamaica in the West Indies (Swartz).

RANGE: Me. (430.02), Mass. (140), R. I. (145), Conn. (212), N. Y. (4), Ky. (218), Mo. (140.1), Wyo. (84.2), Ark. (140.1), La. (140.1), Miss. (140.1), Ala. (140.1), Fla. (266), Ga. (52), S. C. (140.1), N. C. (43), Tenn. (464), Va. (271), W. Va. (3.1), D. C. (140.1), Del. (140.1), N. J. (140.1); West Indies (428.3); Bermuda (146).

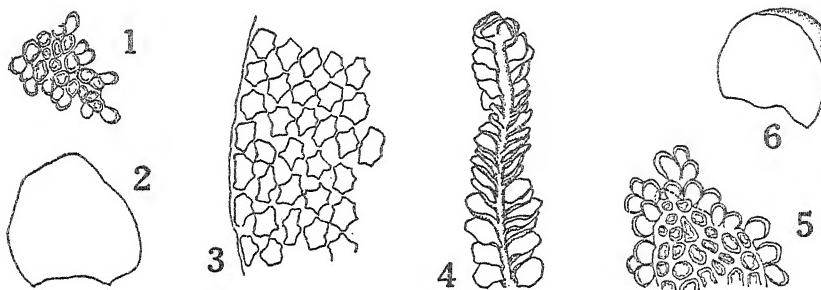
We have included in the range only reports of 1903 and later, the earlier ones being considered too doubtful.

4. *Odontoschisma elongatum*¹¹⁵ (Lindb.) Evans, Rhodora 14:13, 1912.

O. denudatum var. *elongatum* Lindb., Not. Saellsk. Fauna Fl. Fennica 13:361, 1874.

Plants in patches, yellowish brown or blackish green to deep purple. Stems 1-3 cm long, prostrate with ascending branches or tips, flagella few; branches few, ventral and some lateral; gemmiparous branches rare, ascending. Rhizoids few. Leaves alternate, distinctly succubous, not decurrent, contiguous to slightly imbricate, spreading, roundish to $\frac{1}{4}$ longer than wide, commonly 500-700 μ long and wide, slightly concave, unlobed; apex rounded to truncate; margin entire, not or at most very indistinctly bordered, not or hardly incurved. Cells of the leaf middle 20-25 μ , of the margin 20-22 μ , of the base about the same as the middle; walls mostly thin except for the confluent or nearly confluent trigones; trigones large and usually bulging distinctly, making the cell cavity strongly sinuous to stellate; cuticle smooth or nearly so. Gemmae rare, on the tips of

¹¹⁵ ē lōng gā' túm.



Odontoschisma elongatum. 1, Underleaf, x 170. 2, Leaf, x 17.7. 3, Cells along leaf margin, x 170. 4, Part of plant, dorsal view, x 5.7. 5, Underleaf, x 170. 6, Leaf, x 17.7. (All after K. Mueller.)

ascending branches, ovoid, 2-celled, 20-33 μ , with thin walls. Underleaves common but not present throughout, disappearing on the older parts, larger toward the branch tips, variable but usually quadrate to oval or shortly lingulate, with slime papillae on the margin and the abaxial surface. Plants unisexual. Male plants unknown. Female inflorescence on a short modified ventral or lateral branch; female bracts ovate, about twice as long as the leaves of sterile shoots, 2-lobed for $\frac{1}{3}$ - $\frac{1}{2}$ their length, crenate to dentate, the lobes acute; the sinus narrow; female bracteole similar to the bracts. Mature perianth and sporophyte unknown. The name the *L. elongatus*, lengthened; because the stems are longer than those of *O. denudatum*, of which it was once considered a variety.—In wet peaty situations; among other bryophytes; alpine.

ILLUSTRATIONS: Macvicar (374) 309, figs. 1-3; K. Mueller (409) 2: fig. 62; C. Jensen (323.5) 195, 1 fig.

EXAMINATIONS: None.

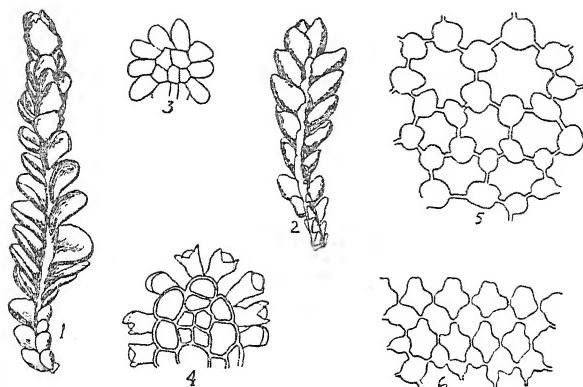
TYPE LOCALITY: Lycksele, Lapland (Angstrom). The type material was distributed as *Sphagnoecetis communis* by Gottsche & Rabenhorst as their Hep. Eur. Exsic. No. 440.

RANGE: Greenland (164), Me. (369.1), N. H. (203), Ont. (164); Iceland (409); Eur. (409).

5. *Odontoschisma gibbsiae*¹¹⁶ Evans, Bot. Gaz. 36:341, 1903.

Plants in mats or creeping among other bryophytes, yellowish green to reddish or brownish green. Stems prostrate with ascending tips, about 300 μ thick, with ventral or terminal flagella, sparingly and irregularly branched; branches ventral or lateral. Rhizoids few. Leaves alternate, distinctly succubous, not to slightly decurrent dorsally, imbricate, erect-spreading, not lobed, orbicular, about 1 mm long and wide, gradually larger from the base of a leafy shoot upward, not bordered by different cells, strongly concave, more or less dilated at ventral base, arching to

¹¹⁶ gib' si ē.



Odontoschisma gibbsiae. 1, Part of plant with 3-ranked leaves above, x 9. 2, Part of plant, ventral view, x 9. 3, Young underleaf, x 125. 4, More mature underleaf, x 125. 5, Median leaf cells, x 175. 6, Marginal leaf cells, x 125. (After Evans.)

or beyond the middle of the stem, apex rounded; margin entire. Cells of the leaf middle about 19μ , of the margin 16-23 μ , of the base about 23 μ , the pigment limited to the lining of the cell cavity; cell walls thin between trigones; trigones very large, rounded and greatly bulging into the cell cavity, the cell cavity therefore stellate, and the thin places mere pits, occasional trigones confluent; cuticle very thick, smooth to minutely verruculose. Gemmiparous branches thin, vermiciform, long, simple, prostrate to ascending, terminating normal vegetative branches; gemmae single or in chains, on the margins and the abaxial surfaces of the upper leaves, and also from the tip of the stem, ovoid to pyriform, 1-2-celled, outer wall thick, transverse wall thin. Underleaves minute except at the base of a branch, irregular in form, sometimes vaguely 2-toothed, with slime papillae on the margin. Reproduction and sporophyte unknown. Named in honor of Gertrude Gibbs, who first found it, while working at the Minnesota seaside biological station.—On a log.

ILLUSTRATIONS: Evans, Bot. Gaz. 36: pl. 19, figs. 29-34, 1903; Clark & Frye (81) 119, figs. 1-6.

EXAMINATIONS: B. C. Port Renfrew on Vancouver Island (Gertrude Gibbs) 1901.

TYPE LOCALITY: Port Renfrew on the south shore of Vancouver Island, British Columbia (Gertrude Gibbs). This is about Lat. $48^{\circ} 35' N.$, Long. $124^{\circ} 13' W.$

RANGE: B. C. (140.1). Known only from the type collection.

6. *Odontoschisma macounii*¹¹⁷ (Aust.) Underw. Bull. Ill. State. Lab. Nat. Hist. 2:92, 1884.

Sphagnoecetis macounii Aust., Bull. Torr. Bot. Club 3:13, 1872.

Sphagnoecetis communis var. *tessellata* Berggr., Kongl. Sv. Vet. Akad. Handl. 13(7) :101, 1875.

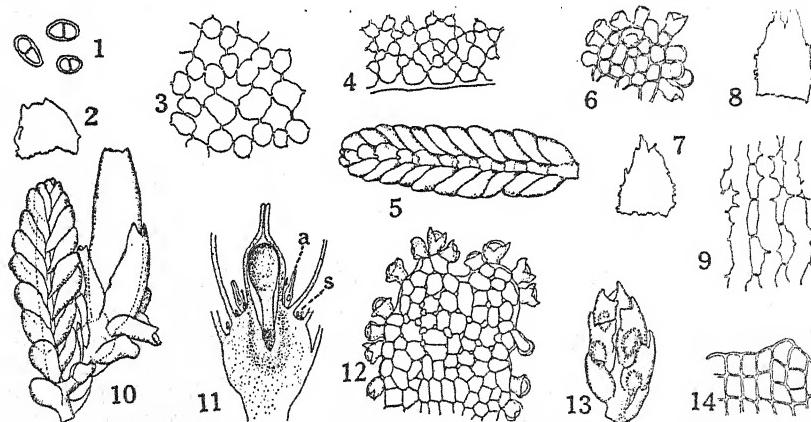
Jungermannia tessellata Berggr., Kongl. Sv. Vet. Akad. Handl. 13(8) :43, 1875.

Cephalozia austini Pears. List of Canadian Hep. 10, 1890, a part of Geol. and Nat. Hist. Survey of Canada.

O. tessellatum C. Jens., Medd. om Groenland 15:369, 1898.

O. sphagni var. *tessellatum* Kaal., Vidensk. Skrift. 1:14, 1898.

Plants in patches or creeping among other bryophytes, pale green to whitish green or rarely brownish green. Stems 0.8-1.5 cm long, prostrate or with apex and branches ascending, flexuose, about 200 μ thick, almost leafless below, with occasional flagella; flagella ventral in origin, mostly from basal region of the plant, with distant rudimentary leaves; branches few, mostly lateral in origin but some ventral. Rhizoids few except on the flagella and near base of stem, not on the underleaves, colorless. Leaves alternate, almost transverse to distinctly succubous, not decurrent, imbricate, erect to erect-spreading, broadly roundish, about 750 μ long and 850 μ wide, not lobed, almost hemispherically concave, not bordered by different cells; about half clasping the stem; apex rounded to indistinctly 2-lobed; margin entire, widely incurved, not dilated at the ventral base. Cells of the leaf middle about 28 μ , of the margin 22-25 μ , and of the base about the same as of the middle; walls thin between trigones; trigones large, sometimes almost as large as cell cavities, bulging far into the cell, making the cell cavity stellate, marginal wall of the outer



Odontoschisma macounii. 1, Three gemmae, $\times 212$. 2, Male bracteole, $\times 24$. 3, Median leaf cells, $\times 212$. 4, Marginal leaf cells, $\times 148$. 5, Tip of plant, ventral view, $\times 24$. 6, Underleaf, $\times 148$. 7, Female bracteole, $\times 10.6$. 8, Female bract, $\times 10.6$. 9, Cells from middle of perianth, $\times 148$. 10, Part of plant with perianth, $\times 10.6$. 11, Longitudinal section of female tip with archegonia (a) and slime cells (s), $\times 24$. 12, Underleaf, $\times 148$. 13, Male inflorescence, $\times 24$. 14, Part of mouth of perianth, $\times 148$. (All after Evans.)

¹¹⁷ mä kōn'ī l.

row of cells thick; cuticle quite thick, smooth. Gemmae at the tips of small-leaved branches, from the margins of the leaves and underleaves, 1-2-celled, ovoid to ellipsoid, with rather thick walls. Underleaves common, small to large, on upper part of gemmiparous stems as large as the leaves, concave and appressed when large, roundish to longly oval, with slime papillae; the slime papillae numerous, marginal, pyriform. Plants unisexual; both inflorescences on short lateral or short ventral branches. Male branch short, lateral or usually ventral; male inflorescence bud-like, constituting about all the male branch; male bracts 6-8, smaller than the leaves of normal sterile stems, quite concave, truncate to shortly 2-lobed, inflated near ventral base, often with a small inflexed tooth about the middle of the dorsal margin; male bracteole like the male bracts; antheridium 1. Female branch short, modified, usually ventral but sometimes lateral in origin; female bracts larger than the largest of the leaves of sterile branches, ovate, about 1.4 mm long and 750 μ wide, concave, 2-lobed to about $\frac{1}{4}$ the length; the margins subentire to irregularly toothed; the lobes and sinus both acute, with numerous marginal papillae; female bracteole like the bracts in size and form. Perianth shortly cylindric, about 3.4 mm long and 950 μ wide, $\frac{1}{2}$ - $\frac{3}{4}$ -emergent, somewhat contracted at both ends, bluntly 3-angled, more plicate toward mouth, gradually and little narrowed to mouth; mouth $\frac{1}{2}$ - $\frac{3}{5}$ the diameter of the perianth, irregularly slightly lobed and entire to crenulate. Sporangium ovoid. Elaters about 9 μ thick; spirals 2, loosely wound. Spores about 14 μ , finely verruculose, reddish brown to brown. Named in honor of John Macoun, a Canadian botanist, who first found it.—On rocks; on thin soil over rocks; alpine.

ILLUSTRATIONS: Evans, Bot. Gaz. 36: pl. 18, 1903; K. Mueller (409) 2: fig. 64; Macvicar (374) 310, figs. 1-7; Meylan (386) fig. 153; C. Jensen, Medd. om Groenland 15:370, figs. 1-4, 1898.

EXAMINATIONS: Minn. Grand Marais in Cook County (G. H. Conklin 3552) 1930.

TYPE LOCALITY: Twenty-five miles north of Michepicoten, Ontario (John Macoun). This would make it close to Lat. 48° 14' N., Long. 84° 53' W.

RANGE: Greenland (320), Ellesmere Isl. (56.01), N. S. (413), Keewatin District of Canada (485.6), Que. (485.6), Ont. (373), Mich. (97.1), Wis. (97.2), Minn. (97.1), Yukon (140.1), Alaska (56.01); Asia (325); Spitzbergen (56.01); Eur. (325).

CEPHALOZIOIDEAE¹¹⁸

Stems prostrate to erect; sterile branches ventral in origin. Leaves alternate, succubous but varying from nearly transverse to nearly horizontal in insertion, not or hardly decurrent dorsally, simply 2-lobed, without a border of different cells; margins entire to sinuate; lobes equal or when unequal the ventral one the larger; sinus descending $\frac{1}{6}$ - $\frac{2}{3}$ the leaf length. Cells of the leaf middle with walls thin or somewhat thickened; trigones none to small. Gemmae spherical or elliptical to ovoid or

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angular, 1-2-celled, unknown in a number of species. Underleaves wanting, or on sexual branches only, or scarce to moderately abundant. Plants bisexual or unisexual. Male inflorescence on a stem or lateral branch, or often on a ventral branch, terminal when the branch is short, or usually farther down when it is elongate; male bracts 2-3-lobed, often with 1 tooth on the dorsal margin; antheridia 1 per bract. Female inflorescence on an ordinary stem, or on a lateral or usually a ventral branch, the branch commonly short and modified; female bracts larger than the leaves, 2-5-lobed; bracteole free or united with one or both bracts. Perianth $\frac{1}{2}$ - $\frac{7}{8}$ -emergent, $1\frac{1}{4}$ -5 times as wide as the mouth, mostly 3-ridged with one ridge dorsal, the ridges blunt and entire; mouth not tubular, not entire. Seta in cross section so far as well known of 8-15 large epidermal cells; interior cells 4 or more, equal to or smaller than the epidermal ones. Sporangium with wall 2-3 cells thick.

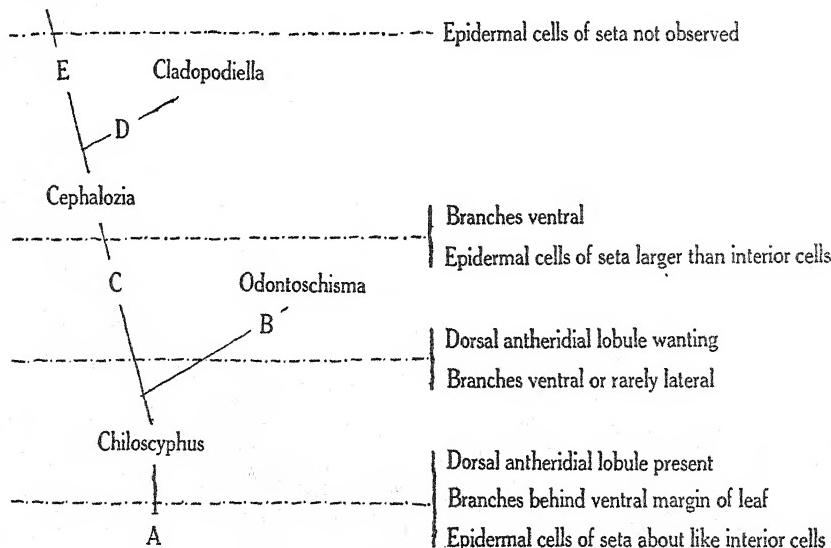
Leaves with ventral margin not greatly arching or if so not incurved to form a sac-like cavity; leaf lobes rounded to acuminate, but if sharp the tip ending at most in a single row of 3 cells.

Epidermal cells of the stem pellucid; sinus descending $\frac{1}{4}$ - $\frac{1}{2}$ the leaf length; underleaves scarce..... *Cephalozia*, p. 477

Epidermal cells of the stem not pellucid; sinus descending $\frac{1}{6}$ - $\frac{1}{2}$ the leaf length; underleaves moderately abundant but small *Cladopodiella*, p. 500

Leaves with ventral margin very greatly arching near base and incurved to form a sac-like cavity; leaf lobes ending in a very long incurved acumen tipped with a single row of 5-10 cells *Nowellia*, p. 504

Nowellia



Phylogenetic diagram of North American Cephalozioideae and Odontoschismoideae.

RELATIONSHIPS AMONG NORTH AMERICAN CEPHALOZIOIDEAE AND
ODONTOSCHISMOIDEAE

The remarks under the letters below are pertinent at the corresponding letters on the diagram on opposite page.

- (A) Gemmae not angular; leaves not lobed or shallowly 2-lobed; female inflorescence a modified branch.
- (B) Trigones moderately large to bulging.
- (C) Epidermis of stem pellucid; gemmae angular or not so; leaves deeply 2-lobed; female shoot mostly with normal leaves; trigones small.
- (D) Epidermis of stem not pellucid.
- (E) Gemmae not angular; epidermis of stem not pellucid. Structure seta unknown.

CEPHALOZIA¹¹⁰ Dum. Rec. d'Obs. 18, 1835.

- ngermannia* section *Cephalozia* Dum. Syll. Jung. 60, 1831.
- ungermannia* section *Bicuspides* Nees Naturg. Eur. Leberrn. 2:211, 1836.
- Trigonanthus* Spruce, Trans. Bot. Soc. Edinburgh 3:207, 1849.
- Cephalozia* subgenus *Eucephalozia* Spruce, On Cephalozia 30, 1882.
- Eucephalozia* Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3):97, 1895.

Plants whitish green or yellowish green to brownish or blackish; normal sterile leafy shoots 0.4-1 mm wide. Stems small, 0.3-3 cm long, prostrate to suberect, simple or branched, with or without flagella; the branches ventral in origin; epidermal cells of the stem more or less pellucid, usually larger than the interior ones. Rhizoids few to numerous, usually more or less in groups. Leaves alternate, succubous but varying from nearly transverse to nearly succubously horizontal in their insertion, distinctly to not at all decurrent, distant to imbricate, simply 2-lobed, about as wide as long or a little longer; margin entire; lobes equal or usually the ventral one a little larger, often connivent; sinus descending $\frac{1}{4}$ - $\frac{2}{3}$ the leaf length, acute to rounded. Cell walls of leaves thin or slightly thickened; trigones none or very small; cuticle usually smooth, sometimes papillose. Gemmae at the tips of the stems, 1-celled, spherical to ovoid or angular. Underleaves rarely a few on sterile stems, present among the female bracts and the bract-like leaves beneath them, sometimes present on male branches and among male bracts. Plants bisexual or unisexual. Male inflorescence terminal or intercalary on a main shoot or on an elongate ventral branch, or terminal on a short ventral branch; male bracts commonly 2-lobed, rarely 3-lobed; antheridia 1 per bract. Female inflorescence usually on a short ventral branch, rarely terminal on a long ventral branch or on a main stem; female bracts nearly always united with each other and with the bracteole, larger than the leaves, as long as wide, or longer, 2-5-lobed; bracteole always present. Perianth free from the bracts, $\frac{1}{2}$ - $\frac{7}{8}$ -emergent, 3-angled at least near tip, one of

¹¹⁰ sčef à 16' zí á.

CEPHALOZIA	1 <i>pleniceps</i>	2 <i>ambigua</i>	3 <i>bicuspidata</i>
1. Plants with flagella.....	+	+	+
2. Plants bisexual or unisexual.....	b	b	b
3. Leaves dorsally decurrent greatly, moderately, little, not.....	n-l	n	n
4. Leaves about equal in length and width, or the number of times as long as wide indicated.....	e	e	e
5. Rhizoids when mature with several lobes at tip.....	-	-	-
6. Median cells of leaf from normal sterile stem, in μ	30-40	25-35	35-42
7. Lobes of sterile leaves not, little or distinctly connivent.....	n-d	n-d	1-d
8. Cells of leaf lobes from normal sterile stems, in μ	30-35	22-30	35-42
9. In cross section of stem the epidermal cells much larger than the interior ones.....	+		+
10. Sinus of sterile leaf descending fraction of leaf length indicated.	$\frac{1}{3}-\frac{1}{2}$	$\frac{1}{3}-\frac{1}{2}$	$\frac{1}{2}-\frac{3}{8}$
11. Width of leaf of normal sterile stem, in number of cells.....	12-18	10-12	10-15
12. Female inflorescence on a short or a long branch.....	s	s	s
13. Female bracts with number of chief lobes indicated.....	2-4	2	2
14. Sinus of female bract descending fraction of bract length indicated.....	$\frac{1}{4}-\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{2}$
15. Mouth of perianth crenulate, dentate, setulose, ciliate, laciniate, lobed, sub.....	cd	b+c	1d
16. Male bracts larger, smaller or about same as leaves of normal sterile stems.....	1	1	m

the angles dorsal; mouth rather large, not tubular, dentate to ciliate. Seta long, in cross section usually of 8 epidermal cells and 4 smaller interior ones. Sporangium wall 2 cells thick; epidermal cells with nodular thickenings or rarely the whole walls thickened; inner layer with semi-annular thickenings or rarely with annular or nodular ones. Elaters with 2 spirals. Spores 8-18 μ . The name from Gk. *cephale*, head, and *ozos*, branch; in reference to the usual short ventral female branches.

The chief characters showing relationships within the genus are probably the trend toward short ventral reproductive branches in which the female seems to have succeeded first, the mouth of the perianth, the separation of the sexes, the cross section of the stem. The stems and the sporophytes need more study and comparison.

4 <i>lammer-siana</i>	5 <i>conni-vens</i>	7 <i>loitelle-bergeri</i>	6 <i>affinis</i>	8 <i>lacinu-lata</i>	10 <i>media</i>	11 <i>macro-stachya</i>	9 <i>catenu-lata</i>	12 <i>leucan-tha</i>	13 <i>macounii</i>
—	—	—	—	—	—	—	—	—	—
b	b	b	b	u	u	u	u	u	u
n	m	m	g	n-1	g	m	n-m	n	n
1.25	e	e	e	e	e	e	e	e	1.5
—	+	—	—	—	—	—	—	—	—
38-60	43-50	28-32	30-45	45-50	22-30	21-30	16-20	12-20	12-18
n-d	d	n-d	n-d	n-1	d	n-1	n-1	n-1	n-1
35-40	40-46	30-35	30-35	20-50	20-27	23-30	15-18	12-20	12-18
+	+	+	+		+	—	+	+	+
$\frac{1}{2}$ - $\frac{2}{3}$	$\frac{1}{6}$ - $\frac{1}{2}$	$\frac{2}{5}$ - $\frac{1}{2}$	$\frac{1}{4}$ - $\frac{1}{3}$	$\frac{1}{2}$ - $\frac{3}{5}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$ - $\frac{3}{5}$	$\frac{2}{3}$
14-16	7-10	10-12	7-10	7-8	7-14	10-12	8-14	6-8	5-7
1	s	s	s	1-s	s	s	s	s	s
2	2	2-5	2-3	2	2	2	2-3	2-3	2
$\frac{1}{3}$ - $\frac{3}{5}$	$\frac{3}{4}$	$\frac{2}{3}$ - $\frac{3}{4}$	$\frac{1}{4}$ - $\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{3}$ - $\frac{2}{5}$	$\frac{1}{4}$ - $\frac{1}{3}$	$\frac{1}{2}$
ld	b+1	nl	nd	n+1	cd	1	ul	b+s	s
m	s	m	s	1	m	1	m	1	

1. *Cephalozia pleniceps*¹²⁰ (Aust.) Lindb., Medd. Soc. Fauna Fl. Fennica 9:158, 1883.

Jungermannia pleniceps Aust., Proc. Acad. Nat. Sci. Philadelphia 21(1869):222, 1870.

C. alpicola Massal. Hep. Veneta 89, 1870.

C. bicuspidata var. *alpicola* Massal. & Carest., Nuov. Giorn. Bot. Ital. 12:339, 1880.

C. crassiflora Spruce, On *Cephalozia* 40, 1882.

C. symbolica var. *sphagnorum* Massal., Malpighia 21:18, 1907.

*C. macrantha*¹²¹ Kaal. & Nichols, Jour. Bot. 49:105, 1911.

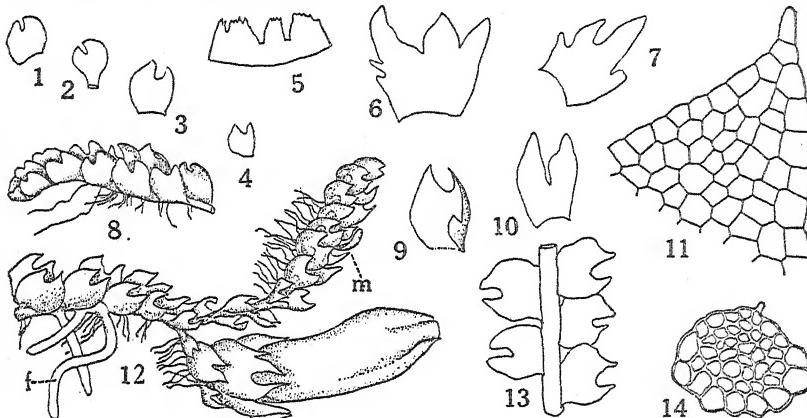
C. pleniceps var. *macrantha* K. Muell., Rabenh. Krypt.-Fl. 6(2):31, 1912.

Plants in patches, pale green to brownish green. Stems 0.6-2 cm long, prostrate to suberect, somewhat flattened dorsiventrally, about 8 cells wide and 7-8 thick, with few branches, with flagella; flagella numerous,

¹²⁰ plēn' ī sēps.

¹²¹ We fail to see anything in this which does not suggest merely an individual response to an unusually wet situation. If that is the case, the differences are not even varietal.

fleshy, leafless or with small leaves; branches arising ventrally; cross section of stem showing two sizes of cells, all with about equally rather thickened walls; epidermal cells the larger, 12-16, the largest 35-40 μ ; interior cells averaging about half as great in diameter. Rhizoids numerous, in groups, rather short. Leaves alternate, quite distinctly succubous to nearly horizontally inserted, not or slightly dorsally decurrent, distant to imbricate, erect-spreading, somewhat dorsally secund, simply 2-lobed, obliquely rounded-ovate, very concave, rather thick, 12-25 cells wide, mostly 300-550 μ wide, margin entire; lobes ovate-triangular, commonly slightly unequal with the ventral one the larger, acute, usually somewhat connivent; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, obtuse to rounded.



Cephalozia pleniceps. 1-4, Leaves, x 12.2. 5, Part of mouth of perianth, x 10.6. 6-7, Female bracts, x 12.2. 8, Part of sterile stem, x 12.2. 9, Male bract, x 10.6. 10, Female bracteole, x 12.2. 11, Cells of lobe of leaf, x 93. 12, Part of plant with perianth, male (*m*) inflorescence and flagella (*f*), x 7.9. 13, Part of sterile stem, dorsal view, x 10.6. 14, Cross section of stem, x 106. (11, after Jensen; 1-4, 6-7, 10, after Howe; the others after K. Mueller.)

Cells of the leaf middle 30-45 μ , of the lobes about the same, of the base 33-60 μ ; walls very little thickened; trigones wanting; cuticle smooth. Gemmae in spherical groups, terminal, ovoid to pyriform, 1-celled, 14-20 μ . Underleaves wanting except occasionally toward the tips of the branches, lingulate. Plants bisexual. Male branches ventral, more or less modified, or the inflorescence on the main stem; male inflorescence terminal or intercalary; male bracts similar to the leaves in size and form, but with an incurved tooth near the base of the dorsal margin; antheridium 1. Female branch ventral in origin, short, much modified; female bracts about twice as long as the leaves, 2-4-lobed for $\frac{1}{4}$ - $\frac{2}{3}$ their length, otherwise entire or with a few blunt teeth; the lobes lanceolate, entire; the sinus acute; bracteole similar to the bracts, narrower, united with the bracts. Perianth cylindric, triangular in the upper $\frac{1}{3}$ - $\frac{1}{4}$, $\frac{1}{2}$ - $\frac{3}{5}$ -emergent, 2-3 cells thick

in lower half, 1 cell thick in upper half, acutely contracted to the mouth; mouth $\frac{1}{4}$ - $\frac{1}{3}$ the width of the perianth, crenulate-dentate. Sporangium cylindric, blackish brown, its wall 2 cells thick; epidermal cells large, rather thickly walled, without thickenings or with nodular thickenings at the margins of the valves; inner wall layer with numerous semiannular thickenings. Elaters about 14μ thick; spirals 2, pale reddish brown. Spores $12\text{-}18 \mu$, densely papillose, reddish brown. The name from *L. plenus*, abundant, and *caput*, head; apparently in reference to the common occurrence of heads of gemmae.—On moist rocks and banks; on peaty soil; among *Sphagnum*; alpine.

ILLUSTRATIONS: Howe, Mem. Torr. Bot. Club 7: pl. 104, 1899; K. Mueller (409) 2: fig. 8; Macvicar (374) 262, figs. 1-6; Meylan (386) fig. 143; Jensen (323.5) 205, 3 figs.; Steere (485.5) 66: figs. 5-9.

EXAMINATIONS: Alta. Altrude Lakes in Banff National Park (Rakestraw) 1937.—B.C. Halcyon (MacFadden 581) 1927.—Mass. Worcester (Greenwood) 1914.—Mich. Sugar Island in Chippewa County (Steere 3474) 1933.—Minn. Pine Island in St. Louis County (Conklin 3070) 1927.—N.H. Glendale (Laura Carter 204) 1904.—N. Y. Brayton (Burnham 6) 1915.—N. S. Halifax (Brown 261) 1924.—Ohio. Champaign County (Taylor) 1923.—Vt. Hartford (Lorenz) 1910.—Wash. Pacific Beach (Foster 1503) 1911.—Wis. Douglas County (Conklin 1896) 1923.—Wyo. Grand Teton National Park (Rakestraw) 1938.

TYPE LOCALITY: White Mts., New Hampshire (Oakes).

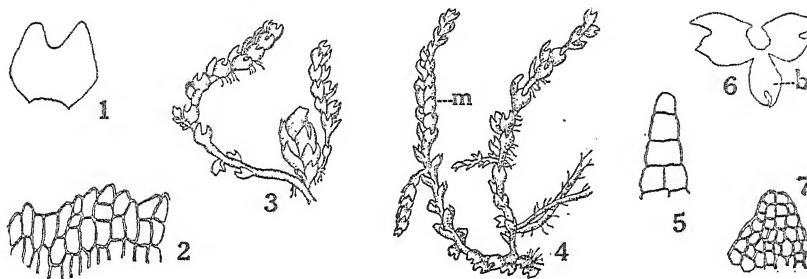
RANGE: Greenland (322), Ellesmere Isl. (56.01), Baffin Isl. (277.2), N.S. (53.2), Me. (155), N.H. (506), Vt. (244), Mass. (303), Conn. (159), N.Y. (58), Que. (431), Ohio, Mich. (415), Wis. (98), Minn. (94.1), Wyo., Mont. (82), Alta. (46.2), Yukon (51), Alaska (190), B.C. (371), Wash. (81), Ore. (457), Cal. (515), N.Mex. (272); Asia (19.05); Eur. (325); Iceland (248.1).

2. *Cephalozia ambigua*¹²² Massal., Malpighia 21:22, 1907.

C. bicuspidata var. *atra* Arn. Lebermoosstudien Noerdlichen Norwegen 10, 1892.
C. bicuspidata var. *arctica* Bryhn & Kaal., Rept. Second Norwegian Arct. Exped. in the "Fram," Bryophyta 44, 1906.

Plants in very small patches, yellowish brown to blackish brown; leafy shoots about 400μ wide. Stems 3-7 mm long, prostrate to ascending, irregularly considerably branched, with several flagella; branches ventral in origin. Rhizoids somewhat numerous, short. Leaves alternate, nearly transverse to succubous, not decurrent, distant to somewhat imbricate, suberect to almost appressed to the stem, simply 2-lobed, ovate to quadrate-ovate, about 400μ wide, distinctly concave; margin entire; lobes triangular-ovate, equal, usually incurved, acute to obtuse or rounded, neither connivent nor spreading; sinus descending $\frac{1}{3}\text{-}\frac{1}{2}$ the leaf length, roundedly obtuse. Cells of the leaf middle $25\text{-}35 \mu$, of the lobes $22\text{-}30 \mu$, of the base $25\text{-}40 \mu$; walls little thickened; trigones none or quite small. Gemmae apparently unknown. Underleaves wanting or a few near the tips of the stems, small, subulate, entire, sometimes a single row of cells. Plants bisexual. Male inflorescence intercalary or terminal on the male branches; male bracts relatively few, like the leaves but more concave. Female branches short,

¹²² am big' ū ū.



Cephalozia ambigua. 1, Leaf, x 32. 2, Part of mouth of perianth, x 85. 3, Part of plant with young perianth, x 7.9. 4, Plant with male (*m*) inflorescence, x 7.9. 5, Underleaf, x 117. 6, Female bracts and their bracteole (*b*) below, x 10.6. 7, Lobe of leaf, x 58. (5, original; all others after K. Mueller.)

modified; female bracts 2-3 times as large as the leaves of sterile stems, 2-lobed for $\frac{1}{3}$ their length; the lobes entire, acute to obtuse; the sinus roundedly obtuse; bracteole narrower than the bracts, similar to the bracts and united with them at base. Perianth half or more emergent, 3-angled to well toward base, gradually contracted to mouth; mouth wide, shortly 4-6-lobed, the lobes crenulate. Sporophyte unknown. The name the *L. ambiguus*, uncertain; expressing Massalongo's feeling about the species when he named it.—On high mountains and in arctic regions, on bare moist soil.

ILLUSTRATIONS: K. Mueller (409) 2:fig. 7; Macvicar (374) 262, figs. 1-4; Gil (76) fig. 280.

EXAMINATIONS: None.

TYPE LOCALITY: European.

RANGE: Ellesmere Isl. (56.01); Pim Island (56.01); Southern Appalachian Mts (64.5); Eur. (409).

3. *Cephalozia bicuspidata*¹²³ (L.) Dum. Rec. d'Obs. 18, 1835.

Jungermannia bicuspidata L. Sp. Pl. Ed. 1, 1132, 1753.

Jungermannia bicayculata Raddi, Mem. Soc. Ital. Modena 19:30, 1817.

Jungermannia rigidula Hueben, Hep. Germ. 174, 1834.

Jungermannia wenzelii Corda, in Sturm Fl. Germ. 2:171, 1836.

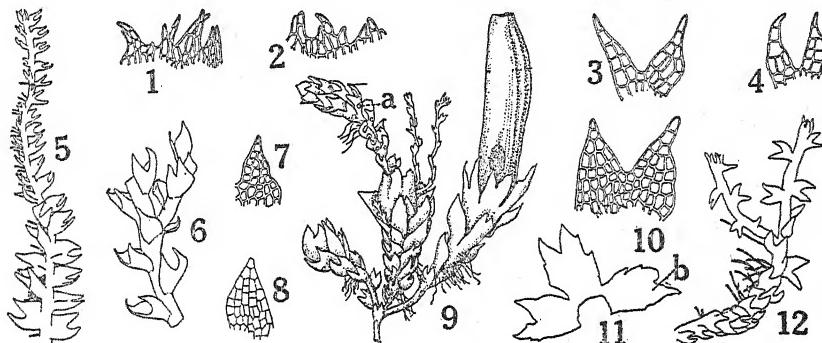
Trigonanthus bicuspidatus Spruce in Hartm. Skand. Fl., Ed. 10, 2:143, 1870.

Eucephalozia bicuspidata Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3):97, 1895.

Plants in patches or scattered among other bryophytes, whitish green or dark green to reddish brown or almost blackish; leafy shoots 0.5-1 mm wide. Stems 0.5-2 cm long, prostrate to ascending, pale green, irregularly branched; flagella several, with small leaves; branches arising ventrally; rejuvenations common underneath the perianth. Rhizoids numerous, in tufts. Leaves alternate, distinctly succubous to nearly transverse, not decurrent, distant to imbricate, spreading to erect-spreading, simply

¹²³ bi" kūs pí dā' tā.

2-lobed, oval or quadrate-oval; normal leaves averaging 12-14 cells wide, concave, larger toward the stem tip; margin entire; lobes lanceolate, commonly slightly unequal with the ventral one the larger, straight or curved in the same direction rather than connivent, ending in a single row of 2-3 cells; sinus descending $\frac{1}{2}$ - $\frac{2}{3}$ the leaf length, acute to rounded; leaves of flagellate branches much smaller, not concave, often divided to near the base, the segments sometimes subulate. Cells of the leaf middle 35-42 μ , of the lobes and of the base about the same, pellucid; walls only slightly thickened; trigones wanting; cuticle smooth. Gemmae rare, in clusters at the tip of the stem or branches, spherical or ovoid, 1-celled, about 25 μ long, whitish green. Underleaves wanting except as associated with the bracts and bract-like leaves below them. Plants bisexual. Male branches arising near the female ones, somewhat elongate and with some



Cephalosia bicuspidata. 1-2, Part of mouth of perianth, varying under different conditions, x 80. 3-4, Small leaves, x 80. 5, Sterile shoot, x 8.8. 6, Part of plant showing branch with modified leaf below it, x 14. 7-8, Lobes of leaves, x 80. 9, Part of plant with perianth and one male branch with antheridia (a), x 7. 10, Large wide leaf, x 80. 11, Female bracts and bracteole (b), x 6.4. 12, Part of plant, the part with distant leaves, growing in a greenhouse, x 8.6. (6, after Evans; 9, 11, after K. Mueller; the others after Rejmert.)

normal leaves at base; male inflorescence terminal or intercalary; male bracts similar to the leaves, rather larger than smaller, more concave, often with a tooth at the base of the dorsal margin; antheridium 1. Female branches ventral in origin, short, or somewhat elongate so there are some normal leaves at base; female bracts about 3 times as long as the normal leaves, 2-lobed to about $\frac{1}{2}$ their length; the lobes triangular to lanceolate, acuminate, entire or with 1-2 teeth on the margins; bracteole united with the bracts at base, similar to the bracts. Perianth cylindric to somewhat fusiform, 2-3.5 mm long, 750-1000 μ wide, $\frac{3}{4}$ - $\frac{7}{8}$ -emergent, 1 cell thick to near the base, bluntly 3-angled near tip, sometimes in maturity the angles extending toward base $\frac{3}{4}$ the length of the perianth, slightly and gradually contracted to the mouth; mouth $\frac{1}{2}$ - $\frac{2}{3}$ the width of the perianth, cilio-dentate, the projections composed of 1-2 rather long cells. Sporan-

gium oblong-oval, blackish brown, its wall of 2 layers of cells; epidermal cells with nodular thickenings; inner layer of wall with semiannular thickenings. Elaters about 12μ thick; spirals 2, loosely wound, reddish brown. Spores $12\text{--}16 \mu$, finely papillose, reddish brown. The name the *L. bi*, two, and *cuspidatus*, with pointed ends; referring to the 2-pointed leaves.—On moist and commonly bare soil; on damp rocks or stones; on rotten wood; in swamps among mosses.

ILLUSTRATIONS: Gil (76) figs. 278-279; Macvicar (374) 259, figs. 1-5; Hooker (285) pl. 11, figs. 1-12, and Suppl. pl. 4; Meylan (386) fig. 142; Ekart (124) pl. 7, fig. 53; Pearson (433) pl. 57; Jensen (323.5) 195, 4 figs.; Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3): fig. 53, A-B; K. Mueller (409) 2: fig. 3; Leitgeb, Die Leberm. 2: pls. 7-8, 1875; Warnstorff (523) 222, fig. 1; Kurz & Little, Bull. Fla. State College for Women 26(3): fig. 66, 1933; Ammons (3.1) 137, fig. A; Douin, Bull. Soc. Bot. France 60:485, fig. 37, 1913; Rejment, Planta Polonica 6: pl. 1, figs. 1-6, 1937.

EXAMINATIONS: Alaska. Ratz Harbor (Frye 308) 1913.—B.C. Roseburg (MacFadden 484) 1927; Swanson (Frye) 1913.—Cal. Weitchpec (Frye) 1933.—Ind. Turkey Run State Park (Drexler 1135 in part) 1937.—Ky. Natural Bridge (Taylor 7) 1925.—Labrador. Port Burwell (Pierre Dutilly 1718) 1933.—Me. Mt. Desert (Greenwood) 1926.—Mass. Worcester (Greenwood) 1908.—Mich. Pictured Rocks (Steere 542) 1933; Tahquamenon Falls in Luce County (Nichols) 1935.—N.H. Waterville (Lorenz 482) 1908.—N.Y. Greenport (Latham) 1939.—N.C. Roan Mt. (Blomquist 87) undated.—Ore. Cape Arago (Frye) 1922.—Wash. Orcas Island (L. Clark) 1925; Mt. Rainier (Svihla 324) 1931.—Wyo. Norris Geyser Basin in Yellowstone National Park (Frye) 1925.

TYPE LOCALITY: European.

RANGE: Greenland (501), Ellesmere Isl. (56.01), Baffin Isl. (277.2), Labrador (510), Miquelon Isl. (373), Anticosti (431), Prince Edward Isl. (373), N.S. (53.2), N.B. (369), Me. (369.1), N.H. (359), Vt. (169), Mass. (232), Conn. (203), N.Y. (64), Que. (178), Pa. (337.09), Ont. (373), Mich. (502), Ind., Ill. (529), Wis. (94.1), Minn. (94.1), Wyo. (446), Mont. (328), Alta. (46.2), Yukon (51), Alaska (239.1), B.C. (508), Ida. (80.1), Wash. (81), Ore. (499), Cal. (84.1), Colo. (175), Fla. (337), Ga. (12), N.C. (480), Tenn. (268), Ky. (218), W.Va. (3.2), N.J. (506); Mex. (224); Asia (19.05); Africa (212); Canary Isles (325); Eur. (374); Spitzbergen (524.3).

4. *Cephalozia lammersiana*¹²⁴ Spruce, On Cephalozia 43, 1882.

Jungermannia lammersiana Hueben., Flora 15:306, 1832.

Jungermannia bicuspidata var. *uliginosa* Nees Naturg. Eur. Leberm. 2:253, 1836.

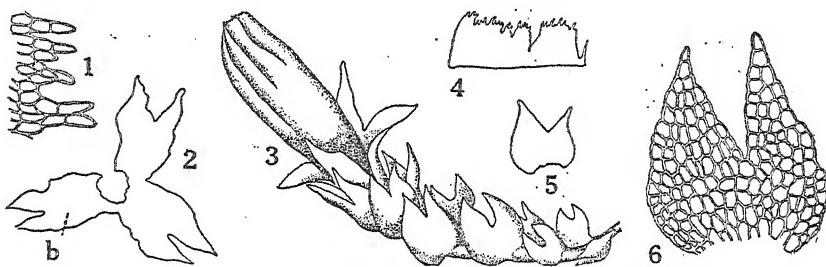
C. bicuspidata var. *lammersiana* Nees Naturg. Eur. Leberm. 2:254, 1836.

C. lammersii Kaal., Nyt. Mag. Naturvid. 33:172, 1893.

Plants in dense spongy mats, dark green to reddish brown or blackish violet. Stems 1.5-3 cm long, ascending, rather sparingly branched, flagella rare or wanting. Rhizoids numerous, from the stem and the bases of the leaves. Leaves alternate, succubous, not decurrent, distant to approximate, erect-spreading, simply 2-lobed, oval to roundish-oval, concave, symmetric at base, 14-16 cells wide; margin entire; lobes unequal, the larger ventral, triangular-lanceolate, acuminate to acute, straight to usually incurved and somewhat connivent; sinus descending $\frac{1}{2}\text{--}\frac{2}{3}$ the leaf length, obtuse to

¹²⁴ "lām" mēr sī ā' nā.

rounded. Cells of the leaf middle 38-60 μ , of the lobes 35-40 μ , of the base 40-60 μ , pellucid; walls but little thickened; trigones none or quite small; cuticle smooth. Gemmae apparently unknown. Underleaves wanting except on male branches and in association with the male and female bracts and the bract-like leaves subtending the latter, subulate. Plants bisexual. Male inflorescence on a somewhat elongate ventral branch, spicate; male bracts similar to the leaves, rather larger than smaller, more concave, often with a tooth at the base of the dorsal margin; male bracteole present; antheridium 1. Female inflorescence on normal elongate branches of ventral origin; female bracts several times as long as the leaves of sterile stems, ovate to almost rectangular, 2-lobed to $\frac{1}{3}$ - $\frac{3}{5}$ the bract length; bracteole united with the basal region of the bracts; the



Cephalozia lammersiana. 1, Part of mouth of perianth, $\times 76$. 2, Bracts and bracteole (*b*), $\times 10.6$. 3, Cross section of stem, $\times 74$. 4, Mouth of perianth, $\times 11$. 5, Leaf, $\times 11$. 6, Leaf, $\times 49$. (All after K. Mueller.)

margin of bracts and bracteole entire to sinuate; the lobes lanceolate-subulate, acuminate, entire, ending in a single row of about 2 cells; the sinus acute. Perianth cylindric to narrowly elliptic, $\frac{1}{2}$ - $\frac{3}{4}$ -emergent, 5-6-plicate near tip and bluntly triangular, 1 cell thick to base, purplish to violet, gradually and not greatly contracted to mouth; mouth hyaline, about half as wide as the perianth, toothed, the teeth 2-3 cells long. Sporangium oval, its wall 2 cells thick; epidermal cells with nodular thickenings; inner layer with semiannular thickenings. Elaters long; spirals 2, reddish brown. Spores 12-15 μ , densely papillose, brownish. Named in honor of C. Lammers, who first collected it.—On moist soil; on wet wood.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 4; Pearson (433) pl. 58; Warnstorff (523) 1:222, fig. 2; Smith, Sowerby's Eng. Bot. pl. 2239; Macvicar (374) 260, figs. 1-6.

EXAMINATIONS: *Alta.* Altrude Lakes in Banff National Park (Rakestraw) 1937; Jasper Lake (MacFadden 307) 1926.—*Ky.* Sand Cave in Bell County (H. E. Bailey) undated.—*Ore.* Multnomah Falls trail (Rakestraw) 1938.—*Utah.* Cedar Breaks National Monument (Rakestraw) 1937.—*Wash.* Marysville (Grant) 1925.

TYPE LOCALITY: Mt. Bructeri (C. Lammers) 1830. Probably in reference to the highest peak in the Harz Mts.

RANGE: Me. (430.02), B.C. (371), Ore. (84.3); Asia (491); Europe (532); Canary Islands (325).

Probably *C. lammersiana* is much wider in distribution in North America than the range above indicates. It was not clearly distinguished from *C. bicuspidata* before 1912. It needs more study and comparison in details of stem, reproduction and sporophyte.

5. *Cephalozia connivens*¹²⁵ (Dicks.) Lindb., Proc. Linn. Soc. 13:190, 1872.

Jungermannia connivens Dicks. Pl. Crypt. Fasc. 4:19, 1801.

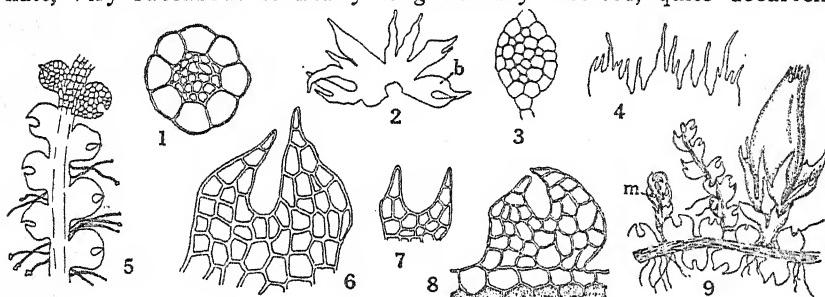
Blepharostoma connivens Dum. Rec. d'Obs. 18, 1835.

Trigonanthus connivens Hartm. Skand. Fl., Ed. 10, 143, 1871, in part.

C. multiflora Lindb., Acta Soc. Sci. Fennica 10:501, 1875.

Eucephalozia connivens Schiffn., Engler & Prantl 1(3):97, 1895.

Plants in patches or creeping among *Sphagnum*, yellowish green; leafy shoots about 1 mm wide. Stems 0.5-1.4 cm long, prostrate or with ascending tips, light green, irregularly branched, flagella wanting; branches arising ventrally, fairly numerous; cross section of stem showing 8-10 very large thin walled epidermal cells, the interior cells very much smaller and with rather thick walls. Rhizoids numerous, in groups, often irregularly swollen at tip as if they had begun a tuft of branches. Leaves alternate, very succubous to nearly longitudinally inserted, quite decurrent



Cephalozia connivens. 1, Cross section of stem, x 85. 2, Female bracts and bracteole (*b*), x 10.6. 3, Cross section of stem, x 74. 4, Mouth of perianth, x 10.6. 5, Part of a sterile stem, x 17. 6-7, Leaves, x 10.6. 8, Leaf and hyaline epidermis of stem, x 65. 9, Part of plant with perianth and male (*m*) inflorescence, x 8.5. (3, after Jensen; 6-7, after Rejment; the others after K. Mueller.)

dorsally, distant to loosely imbricate, horizontally spreading or somewhat dorsally secund, simply 2-lobed, obliquely suborbicular, 7-12 cells wide, the larger ones toward the base; margin entire; lobes triangular, often unequal and then more often the ventral lobe the larger, connivent, acute to acuminate, usually with a row of 2 cells at tip but sometimes with only 1 single cell; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ of the leaf length, obtuse to rounded. Cells of the leaf middle 43-50 μ , of the lobes 40-46 μ , of the base 45-60 μ ; walls thin; trigones wanting; cuticle smooth. Gemmae at apex of stem, oval, 1-celled. Underleaves wanting except with the female bracts

¹²⁵ kön niv' ēns.

and the bract-like leaves subtending them. Plants bisexual. Male inflorescence near the middle or at the end of a ventral branch, the male branch near the female one; male bracts smaller than the leaves, densely imbricate, concave, 2-lobed for $\frac{1}{2}$ the bract length, the dorsal margin with an inflexed tooth; male bracteole wanting; antheridium 1. Female inflorescence terminal on a short modified ventral branch; female bracts much larger than the leaves, 2-3-lobed to about $\frac{3}{4}$ the bract length, the lobes lanceolate-subulate and entire; bracteole deeply 2-lobed, with a tooth on one or both sides, its base united with both bracts. Perianth cylindric when young, somewhat fusiform when mature, $\frac{1}{2}$ - $\frac{3}{5}$ -emergent, bluntly 3-plicate in the upper $\frac{1}{4}$, slightly acutely contracted to mouth; mouth rather wide, about half as wide as the perianth, lobed and longly ciliate, the cilia composed of 4-5 cells. Sporangium oblong-ovoid, reddish brown; epidermal cells with nodular thickenings; innermost wall layer with semi-annular and also some nodular thickenings. Elaters about $200\ \mu$ long, $13-15\ \mu$ thick; spirals 2, reddish brown. Spores $12-15\ \mu$, densely papillose, pale reddish brown. The name the L. *connivens*, inclined toward each other; in reference to the strongly connivent lobes of the leaves.—On wet soil, preferably in peaty or mucky places; on rotting wood; on wet rocks; among *Sphagnum*.

ILLUSTRATIONS: K. Mueller (409) 1: fig. 230 II, and 2: fig. 11; Macvicar (374), 264, figs. 1-6; Jensen (323.5) 201, 8 figs.; Hooker (285) pl. 15; Pearson (433) 2: pl. 60; Meylan (386) fig. 144; Ekart (124) pl. 8, fig. 60; Gil (76) fig. 274; Steere (485.5) 62, figs. 4-7; Rejment, Planta Polonica 6:93, pl. 2, 1937; Ammons (3.1) 137, fig. C.

EXAMINATIONS: B.C. Shushwap Lake (Brinkman 729) 1908.—Cal. Smith River (Rakestraw) 1936.—Conn. Quinebang (Greenwood) 1921.—Fla. Sebring (McFarlin 606) 1934.—Ga. Thomasville (Brown 14) 1923.—Me. Canton (Parlin 8373) 1926.—Md. Round Bay (Plitt 14) 1904.—Mass. Andover (Kingman) 1908.—Mich. Cheboygan (Ammons M236) 1931.—Minn. International Boundary in Cook County (Conklin 3038) 1927.—Miss. Ocean Springs (Pennebaker 6) 1937.—N.H. Mt. Moosilauke (Kingman 2130) 1912.—N.J. Highlands (Haynes 980) 1905.—N.Y. Glen Lake in Warren County (Burnham 28) 1917.—N.C. Pinehurst (Haynes 820) 1905.—N.S. Wobamkeh (Brown 231) 1924.—Ohio. Licking County (Taylor) 1923.—Pa. Glenalden (A.F.K. Krout) 1908.—W.Va. Cranberry Glades in Pocahontas County (Gray H105) 1923.—Wis. Black River in Douglas County (Conklin 1037) 1916.—Vt. Brandon (Dutton 87) 1909.

TYPE LOCALITY: European.

RANGE:¹²⁶ Greenland (248), Labrador (510), Prince Edward Isl. (212), N.S. (53.2), Me. (369.1), N.H. (164), Vt. (245), Mass. (232), R.I. (142), Conn. (299), N.Y. (59), Ont. (212), Pa. (337.09), Ohio, Mich. (415), Ill. (529), Wis. (94.1), Minn. (94.1), Iowa (88), Alta. (46.2), B.C. (46.1), Miss., Fla. (337), Ga. (52), S.C. (299), N.C. (43), Ky. (218.2), W.Va. (3.2), Va. (127), Md. (444), Del. (299), N.J. (459.58); Asia (350); Africa (491); Eur. (409); Bermuda (146).

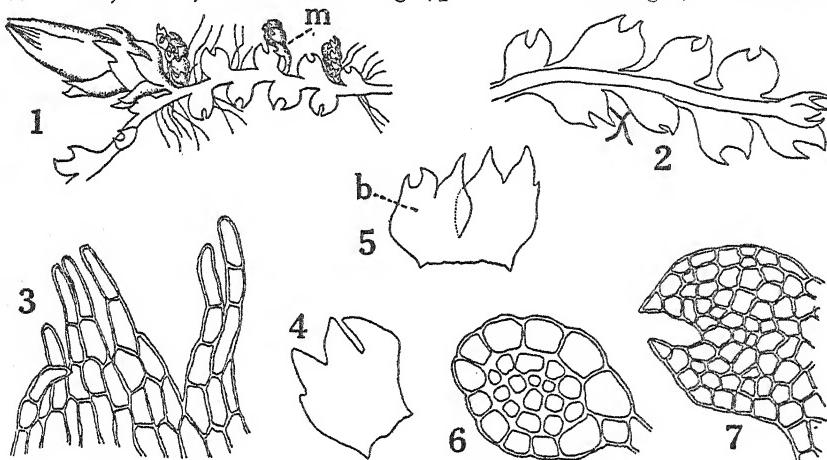
6. *Cephalozia affinis*¹²⁷ Steph., Bull. Herb. Boissier, Ser. 2, 8:277, 1908; also Sp. Hep. 3:291, 1908.

C. affinis Lindb., Medd. Soc. Fauna Fl. Fennica 9:158, 1883. The name only.

¹²⁶ The species was confused with *C. media*, so material cited more than 20 years ago needs re-examination.

¹²⁷ af fin' Is.

Plants in patches, yellowish green. Stems prostrate, without stolons; in cross section oval, with 10-12 large epidermal cells, and with 15 small interior cells with thick walls. Rhizoids moderately numerous, in groups. Leaves alternate, inserted horizontally or slightly succubously, quite longly decurrent at the base, distant to contiguous, horizontally spreading, simply 2-lobed, almost circular, 7-10 cells wide; margin entire; lobes triangular, often unequal and the anterior one usually the larger, straight or usually connivent, acute; sinus descending $\frac{1}{4}$ - $\frac{1}{3}$ the leaf length, rounded to



Cephalozia affinis. 1, Shoot with three male (*m*) inflorescences, $\times 10.6$. 2, Sterile shoot, dorsal view, $\times 17.6$. 3, Part of mouth of perianth, $\times 151$. 4, Female bract, $\times 21$. 5, Female bract and bracteole (*b*), $\times 21$. 6, Cross section of stem, $\times 191$. 7, Leaf, $\times 77$. (All after K. Mueller.)

acute. Gemmae unknown. Cells of the leaf middle 30-45 μ , of the leaf tip 30-35 μ , of the base 35-40 μ ; walls slightly thickened; trigones wanting. Underleaves wanting except in association with the female bracts and bract-like leaves subtending them. Plants bisexual. Male inflorescence constituting short modified ventral branches not far below the female inflorescence; male bracts smaller than the leaves but similar to them, saccately concave; antheridium 1. Female inflorescences terminal on short modified ventral branches; female bracts larger than the leaves, irregularly 3-lobed, or 2-lobed with an outer one of the 3 remaining a tooth; bracteole about as large as the bracts, similar to the bracts in form. Perianth elongate-ovoid, $\frac{1}{2}$ - $\frac{3}{4}$ -emergent, bluntly 3-plicate in the upper third, one cell thick to base, acutely narrowed to mouth; mouth $\frac{1}{5}$ - $\frac{1}{4}$ as wide as the perianth, shortly laciniate, the laciniae ending in teeth 2-3 cells long, the cells of the teeth 1.5-3 times as long as wide. Sporangium ovoid, reddish brown. Elaters 8-9 μ thick; spirals 2. Spores 8 μ , finely punctate, reddish brown. The name the *L. affinis*, related to or near to; because it is very close to *C. media*.—On rotten wood.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 16.

EXAMINATIONS: Cal. Sisson, now Shasta City (Pendleton) 1913.—Wash. Cow-litz County (Rakestraw) 1939.

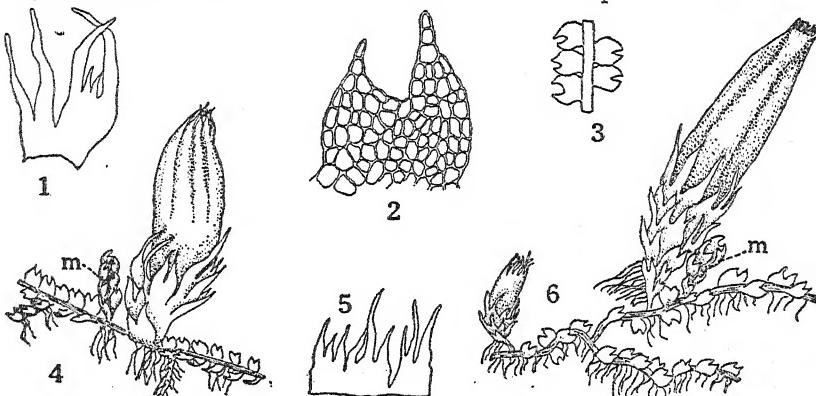
TYPE LOCALITY: European.

RANGE: Cal. (172), Wash.; Eur. (409).

From the distribution, the few collections, the close resemblance of this to *C. media*, and the rather common occurrence of the latter, we are led to wonder whether the careful re-examination of specimens labeled *media* would not increase the range of *affinis*. The basic difference lies in that *C. media* is unisexual and *C. affinis* is bisexual.

7. *Cephalozia loitlesbergeri*¹²⁸ Schiffn. Bryologische Fragmente No. 73, in Oesterr. Bot. Zeitschr. No. 5, 1912.

Plants in patches, yellowish green; leafy shoots about 1 mm wide. Stems 0.5-1 cm long, prostrate, geniculate, irregularly and rather much ventrally branched, stoloniferous; in cross section showing 10 large epidermal cells and 14-16 much smaller interior ones; epidermal cells thin walled, about 40 μ in diameter; interior cells with thick walls, about 15 μ in diameter. Rhizoids numerous to near the tip. Leaves alternate,



Cephalozia loitlesbergeri. 1, A single female bract, x 16.4. 2, Leaf, x 65. 3, Part of sterile stem, dorsal view, x 16.4. 4, Part of plant with perianth and male (m) inflorescence, x 11. 5, Part of mouth of perianth, x 22. 6, Part of plant with perianth and male (m) inflorescence, x 11. (All after K. Mueller.)

nearly horizontal to distinctly succubous, distinctly dorsally decurrent, distant to approximate, spreading to horizontally spreading, sometimes somewhat dorsally secund, simply 2-lobed, broadly ovate to somewhat quadrate, 10-12 cells wide, averaging about 35 μ wide; margin entire; lobes narrowly triangular, from erect to connivent even to crossing each other, comparatively long pointed, ending in a single row of 2-3 cells; sinus descending $\frac{2}{5}$ - $\frac{1}{2}$ the leaf length, acute to usually rounded. Cells of

¹²⁸ löit' lës bërg' èr I.

the leaf middle 28-32 μ , of the lobes 30-35 μ , of the base 28-33 μ ; walls somewhat thickened; trigones none or small. Gemmae apparently unknown. Underleaves wanting except in association with the female bracts and the bract-like leaves subtending them. Plants bisexual; both sexual branches short, modified, ventral. Male branches near the female ones; male inflorescence constituting practically the whole branch; male bracts 6-8, about like the leaves in size, rather more deeply 2-lobed, imbricate, concave at base. Female branches with larger leaves which grade into the bracts; female bracts 4-5 times as long as the leaves, 3-5-lobed for $\frac{2}{3}$ - $\frac{3}{4}$ their length; the lobes lanceolate-subulate, entire, irregularly unlike, ending in a single row of 2-4 cells; the sinus acute; bracteole similar to the bracts, 2-3-lobed. Perianth oblong, large, about 5 mm long and 1 mm wide, $\frac{3}{5}$ - $\frac{4}{5}$ -emergent, 1 cell thick to the base, plicate in the upper $\frac{2}{3}$, slightly and very gradually narrowed to the mouth; 3 of the plicae in maturity extending well toward base, mouth large, about half the width of the perianth, deeply laciniate-ciliate; cilia ending in a single row of 4-6 comparatively long cells. Sporangium ovoid, reddish brown; epidermal and inner wall layers both with nodular thickenings. Elaters 10-12 μ thick. Spores about 12 μ , reddish brown. Named in honor of Prof. K. Loitlesberger of Goerz, who first found it.—On wet peaty soil or among *Sphagnum*.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 12; Macvicar (374) 267, figs. 1-5; Steere (485.5) 66, figs. 1-4.

EXAMINATIONS: N.H. Franconia Mts. (Evans) 1908.

TYPE LOCALITY: "Laudachsee" at Gmunden, now in Germany (Loitlesberger), August 1895. About Lat. 47° 57' N., Long. 13° 55' E.

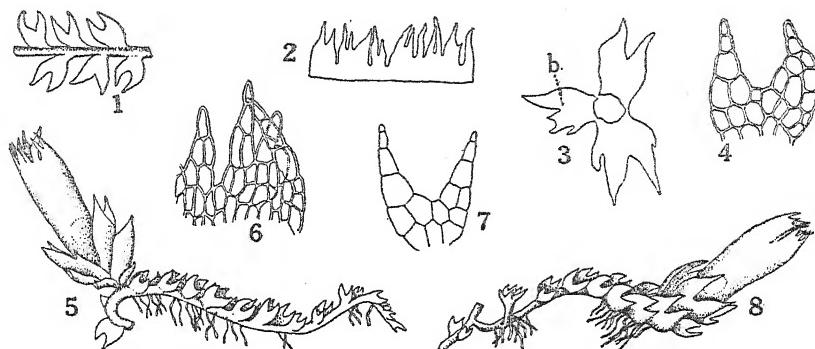
RANGE: N.S. (413), N.H. (191), Conn. (191), Mich. (213); Eur. (409).

8. *Cephalozia lacinulata*¹²⁹ (Jack) Spruce, On *Cephalozia* 45, 1882.

Jungermannia lacinulata Jack, in Gottsche & Rabenh. Hep. Eur. Exsic. No. 624, 1877.

Plants small, in patches, yellowish green. Stems prostrate, branched; branches ventral in origin. Rhizoids numerous at least on certain portions of the stem. Leaves alternate, distinctly succubous, not or hardly dorsally decurrent, rather distant to somewhat imbricate, erect-spreading to spreading or dorsally secund, simply 2-lobed, broadly ovate, narrowed at base, the normal ones 5-7 cells wide, almost plane; the leaves of sterile shoots usually composed of only 15-20 cells; margin entire; lobes triangular to lanceolate, often unequal with the ventral usually the larger, acute, mostly erect or spreading, rarely slightly connivent; sinus descending $\frac{1}{2}$ - $\frac{3}{5}$ the leaf length, right-angular to rounded. Cells of the leaf middle 45-50 μ , of the lobes 20-50 μ , of the base 35-45 μ ; walls thin or nearly so; trigones none or very small. Gemmae unknown. Underleaves wanting or rarely a few. Plants unisexual. Male plants in separate patches; male inflorescence

¹²⁹ lā sīn" ū lā' tā.



Cephalosia lacinulata. 1, Part of sterile plant, x 16. 2, Mouth of perianth, x 85. 3, Female bracts and bracteole (*b*), x 16. 4, Leaf, x 85. 5, Plant with perianth, x 16. 6, Part of mouth of perianth, x 85. 7, Leaf, x 85. 8, Plant with perianth, x 16. (All after K. Mueller.)

on ventral branches, terminal or intercalary; male bracts larger than the leaves of sterile stems, densely imbricate, extending toward the stem tip, elongate-ovate, with a short blunt incurved tooth near base of dorsal margin; antheridium 1. Female branch ventral, more or less elongate, modified when short, unmodified when long; female bracts about twice as long as the normal stem leaves, 2-lobed to about $\frac{1}{2}$ their length, sometimes with an additional tooth on one or both margins; the lobes lanceolate and acute or acuminate; the sinus obtuse; bracteole oval, 2-3-lobed, sometimes with an additional tooth on one margin, hardly united with the bracts at base. Perianth cylindric, $\frac{3}{4}$ - $\frac{7}{8}$ -emergent, somewhat bluntly triangular in cross section, gradually and but little contracted to mouth; mouth wide, $\frac{3}{4}$ as wide as the perianth, with 12-14 laciniae; laciniae unequal, lanceolate, sharply pointed, split into numerous hair-like segments ending in cilia. Sporophyte unknown. The name the L. *lacinulatus*, finely split up; in reference to the mouth of the perianth.—On rotten wood.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 20; Meylan (386) fig. 148.

EXAMINATIONS: None.

TYPE LOCALITY: In Leutkirch Forest near Salem in Baden, Germany (Jack), October, 1875.

RANGE: Mich. (213); Eur. (409).

The discovery of this species by Mrs. Mary S. Taylor in Michigan is remarkable. The location is east of Newberry, the county seat of Luce County in the Northern Peninsula. The plant is otherwise known from only a few scattered locations in Europe. K. Mueller (409) says that there is material so labeled in the herbarium of Stephani, accredited to Oregon and to Japan, but expresses the belief that there is an error. With the Michigan discovery, Oregon material seems much more plausible. Perhaps the material and label both are as stated.

9. *Cephalozia catenulata*¹³⁰ (Hueben.) Spruce, On *Cephalozia* 33, 1882. Not of Lindb. Jour Linn. Soc. 13:191, 1873, according to Schiffner in *Hedwigia* 54:316, 1914.

Jungermannia catenulata Hueben. Hep. Germ. 169, 1834, in part.

Jungermannia bicuspidata var. *ericetorum* G.L. & N. Syn. Hep. 140, 1844.

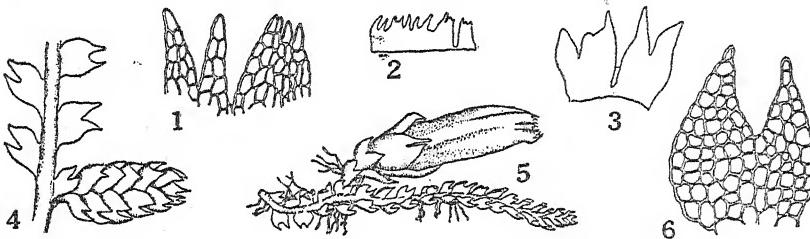
Jungermannia reclusa Tayl., Jour. Bot. 5:278, 1846, in part.

C. reclusa Dum. Hep. Eur. 92, 1874.

C. serriflora Lindb., Medd. Soc. Fauna Fl. Fennica 3:188, 1878.

C. virginiana Spruce, On *Cephalozia* 37, 1882.

Plants in patches or mats, greenish brown or pale brown; leafy shoots 500-600 μ wide. Stems 0.4-1 cm long, prostrate, irregularly branched, without flagella; branches ventral in origin, long, ascending; in cross section with 9-10 epidermal cells. Rhizoids rather few, long, present to near tip of stem. Leaves alternate, distinctly succubous, not to distinctly dorsally decurrent, approximate to imbricate, spreading to horizontally spreading, sometimes dorsally secund, simply 2-lobed, broadly ovate-oval



Cephalozia catenulata. 1, Part of mouth of perianth, x 98. 2, Mouth of perianth spread out, x 17. 3, Female bracts, x 17. 4, Part of stem with male inflorescence, x 11. 5, Part of plant with perianth, x 11. 6, Leaf, x 98. (All after K. Mueller.)

or somewhat quadratic, narrowed at base, slightly concave, 10-15 cells wide; margin entire, except coarsely dentate where grading to the female bracts; lobes triangular, usually unequal with the larger ventral, 4-6 cells wide at the base, acute, straight or slightly connivent, incurved when dry, ending in a single row of 1-2 cells; sinus descending about $\frac{1}{2}$ the leaf length, obtuse to rounded. Cells of the leaf middle 16-20 μ , of the lobes 15-18 μ , of the base 18-25 μ ; walls somewhat thickened; trigones wanting; cuticle smooth. Gemmae in clusters, on the tips of the stems and branches, spherical to ovoid or rarely angular, 1-celled, colorless, 14-18 μ . Under-leaves wanting except in association with the female bracts and the bract-like leaves subtending them. Plants unisexual. Male inflorescence on unmodified ventral branches, terminal or intercalary; male bracts few, closely imbricate, similar to leaves, more concave, with a tooth on the dorsal margin; antheridium 1. Female inflorescence terminal on a very short modified ventral branch; female bracts about twice as long as the leaves, 2-3-lobed for $\frac{1}{3}$ - $\frac{2}{3}$ the length, the margins of the bracts and

¹³⁰ kă tĕn" ū lă' tă.

their lobes spinose-dentate to serrate-dentate; the lobes triangular, acute to acuminate; the sinus acute; bracteole much like the bracts, usually narrower, united at base with both bracts. Perianth oblong or cylindric, $\frac{3}{4}$ - $\frac{7}{8}$ -emergent, bluntly 3-angled for its whole length, 1 cell thick to base, gradually and rather little contracted to mouth; mouth rather wide, $\frac{2}{5}$ - $\frac{1}{2}$ the width of the perianth, subciliate, the cilia 1-3 cells long. Seta long; in cross section showing 8 very large epidermal cells and 4 much smaller interior ones. Sporangium ovoid; wall of 2 layers of cells; epidermal cells with nodular thickenings; inner layer of wall cells with annular thickenings. Elaters 7-9 μ thick; spirals 2, wide, reddish brown. Spores about 9-12 μ , finely papillose, brown. The name the *L. catenulata*, like a little chain; probably in reference to the leafy stems.—On rotten wood; on peaty soil.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 19, but at least not the female branch and bracts of fig. 18; Macvicar (374) 272, figs. 1-5; Pearson (433) 2: pl. 54; Meylan (386) fig. 149; Schiffner, Hedwigia 54:313, figs. 1-4, 1914; Warnstorff (523) 1:222, fig. 5; Gil (76) fig. 277; Ammons (3.1) 137, fig. B.

EXAMINATIONS: Conn. Wamegam (Sheldon 41) 1908.—Fla. Gainsville (Melwin 128) 1916.—Ga. Thomasville (E.B. Taylor) 1906.—Ky. Natural Bridge (Taylor) 1925.—La. Covington (Taylor) 1924.—Md. Swan Creek in Anne Arundel County (Plitt 17) 1905.—Mass. Holden (Greenwood 11) undated.—Minn. Duluth (Conklin 1233) 1912.—N.H. Crawford (Haycock 12) 1912.—N.J. Clementon (Haycock 4) 1906.—N.Y. Little Moose Lake in Herkimer County (Haynes 3009) 1929.—N.C. North Durham (Blomquist 8754) 1937.—N.S. Halifax (Brown 275) 1923.—Ohio. Hocking County (Taylor) 1921.—Pa. Bear Meadows in Center County (C.M. Roberts 39) 1924.—W.Va. Bald Knob (Ammons 238) 1929.—Wis. Black River in Douglas County (Conklin) 1910.

TYPE LOCALITY: On the highest points of the Eifel Mts. between Bonn and Trier, Germany (Huebener).

RANGE: Miquelon Isl. (431), Prince Edward Isl. (373), N.S. (53.2), N.B. (369), Me. (369.1), N.H. (359), Vt. (241), Mass. (232), R.I. (176), Conn. (203), N.Y. (255), Que. (178), Ont. (431), Pa. (237), Ohio, Mich. (415), Wis. (98), Alta. (373), B.C. (508), Ida. (508), Wash. (508), Cal. (508), La. (212), Ala. (498), Fla. (266), Ga. (52), N.C. (43), Va. (515), Ky. (218.2), W.Va. (3.2), Md. (444), N.J.; Mex. (224); Asia (350); Eur. (325); Spitzbergen (524.3).

10. *Cephalozia media*¹³¹ Lindb., Medd. Soc. Fauna Fl. Fennica 6:242, 1881.

*C. lunulaefolia*¹³² of many European and American authors.

Jungermannia connivens f. *symbolica* Gottsche & Rabenh. Hep. Eur. Exsic. No. 624, 1877.

C. catenulata var. *pallida* Spruce, On *Cephalozia* 33, 1882.

C. multiflora Spruce, On *Cephalozia* 37, 1882. Not of Lindb., Acta Soc. Sci. Fennica 10:501, 1875.

C. symbolica Breidl., Mitt. Naturw. Ver. Steiermark 30:330, 1893.

Eucephalozia media Schiffn., Engler & Prantl 1(3):97, 1895.

C. pallida Spruce, Hep. Brit. Isles 146, 1900.

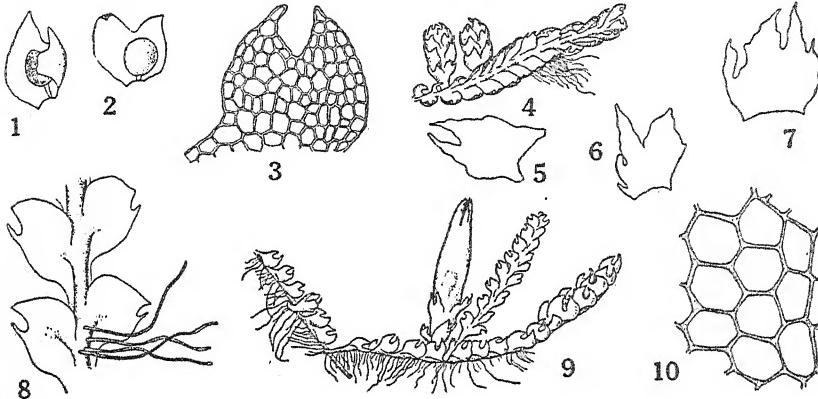
C. symbolica var. *pallida* Massal. Malpighia 21:18, 1907.

Plants in mats or creeping among *Sphagnum*, light green to dark green. Stems 1-2 cm long, prostrate with ascending tips, flat dorsally,

¹³¹ mē' dī ā.

¹³² According to Evans (171) *Jungermannia lunulaefolia* Dum. Syll. Jung. Eur. 61, 1831, which became *Cephalozia lunulaefolia* Dum. Rec. d'Obs. 18, 1835, was based upon a type which was a mixture. At least some of the material, and Dumortier's description fall more nearly under *C. serriflora* Lindb., not found in North America.

convex ventrally; branches few, ventral in origin; flagella wanting; cross section of stem with 10-12 large epidermal cells and 14-15 much smaller interior ones; of the epidermal cells 3 are dorsal, about 25 by 35 μ , larger than the 7-9 ventral epidermal ones. Rhizoids rather few, colorless, long. Leaves alternate, quite succubous to almost horizontally inserted, distinctly dorsally decurrent, distant to loosely imbricate, spreading, some-



Cephalozia media. 1-2, Male bracts with antheridia, x 38. 3, Leaf, x 74. 4, Part of stem with two male inflorescences, x 9.5. 5-7, Female bracts, x 19. 8, Part of plant, ventral view, x 36. 9, Part of plant with perianth, x 9.5. 10, Median cells of leaf, x 196. (8, 10, original, by Helen Gilkey; all others after K. Mueller.)

what dorsally secund, simply 2-lobed, rounded to ovate, 180-400 μ in diameter, somewhat concave, 7-14 cells wide; margin entire; lobes often slightly unequal, the dorsal usually the narrower or more pointed, coninuent, acuminate or acute, ending in one cell or a row of 2 cells; sinus descending about $\frac{1}{3}$ the leaf length, obtuse to rounded. Cells of the leaf middle 22-30 μ , of the lobes 20-27 μ , of the base 25-40 μ ; walls slightly thickened; trigones none; cuticle smooth. Gemmae at the tip of the stem, in clusters, oblong to pyriform or angled to sometimes stellate, 1-celled, greenish white or yellowish, 15-20 μ . Underleaves usually wanting except among the female bracts and the bract-like leaves just beneath them. Plants unisexual. Male inflorescence a short modified ventral branch, or intercalary on an ordinary shoot; male bracts much like the leaves, often 2-lobed for $\frac{1}{2}$ their length, sometimes with a third lobe on the dorsal margin, saccate-concave, very densely appressed-imbricate; antheridium 1. Female inflorescence terminal on a short modified ventral branch; female bracts much larger than the leaves and sometimes united with them, 2-lobed to about $\frac{1}{3}$ their length, sometimes with an additional tooth or lobe on each margin; the lobes lanceolate, acute or acuminate; the sinuses acute to obtuse; bracteole as large as the bracts, often united at base with one of the bracts. Perianth subfusiform, 1.5-2.4 mm long,

400-800 μ wide, $\frac{3}{4}$ - $\frac{4}{5}$ -emergent, with 3 blunt plicae in the upper $\frac{1}{4}$, 3 cells thick near base, usually 2 cells thick to above middle but occasionally only 1 cell thick to near base, gradually and not greatly contracted to the mouth; mouth rather wide, crenulate-denticulate, the teeth 1 or sometimes 2 cells long. Calyptra 2-3 cells thick throughout. Seta short. Sporangium oblong-oval to oblong-cylindrical, reddish brown. Elaters 7-9 μ thick; spirals 2, loosely wound, reddish brown. Spores 10-12 μ , finely papillose, reddish brown. The name from the *L. medius*, in the middle, between; because its characteristics point to two other species.—On rotten wood, on rocks; among *Sphagnum*; on sandy or peaty soil.

ILLUSTRATIONS: Meylan (386) fig. 146; K. Mueller (409) 2: fig. 13; Macvicar (374) 268, figs. 1-6; Jensen (323.5) 205, 6 figs.; Pearson (433) 2: pl. 55; Gil (76) figs. 275-276; Steere (485.5) 62, figs. 8-11; Ammons (3.1) 137, fig. F.

EXAMINATIONS: Alaska. Augustine Bay (Frye) 1913.—Alta. Altrude Lakes in Banff National Park (Rakestraw) 1937.—B.C. Saturne Island (Frye) 1905.—Cal. Orick (Frye) 1935.—Fla. Sebring (McFarlin 1146) 1934.—Ida. Moscow (L. Clark 67) 1923.—Ind. Turkey Run State Park (Drexler 1134) 1937, and (1417) 1938.—Ky. Natural Bridge in Powell County (Taylor) 1925.—Me. Bristol (Chamberlain 682) 1899.—Mass. West Newbury (Haynes) 1902.—Mich. Cheboygan (Ammons 47) 1931.—Minn. Grand Marais (Conklin 2320) 1924.—Mont. Polson (Frye) 1928.—N.C. Vass (Blomquist 7248) 1935.—N.H. Crawford in White Mts. (Haydock 22) 1925.—N.S. Weymouth (Greenwood) 1912.—N.Y. Casenovia (O.F.Cook) 1887.—Ohio. West Jefferson (Taylor) 1921.—Ore. Silverton (Foster 1245).—Pa. Sayre (Barbour 1) 1900.—Que. Seven Islands in Saguenay County (C.B.Robinson) without date.—Tenn. Crossville (Sharp) 1934.—Vt. Ripton (Dutton 148) 1909.—Wash. Republic (Foster 2511) 1913.—W.Va. Durham (Sheldon 3753) 1900.—Wis. Superior (Conklin 602) 1909.—Wyo. Yellowstone National Park (Frye) 1925.

TYPE LOCALITY: European.

RANGE: Greenland (322), Ellesmere Isl. (56.01), Keewatin district of Canada (277.2), Labrador (373), Anticosti (373), Miquelon Isl. (373), Prince Edward Isl. (373), N.S. (53.2), N.B. (369), Me. (368), N.H. (359), Vt. (169), Mass. (232), R.I. (203), Conn. (467), N.Y. (13.1), Que. (178), Pa. (237), Ont. (373), Ohio, Ind., Mich. (419.2), Wis. (0.9), Minn. (212), Wyo. (446), Mont. (81), Alta. (46.2), Yukon (51), Alaska (173), B.C. (373), Ida. (80.1), Wash. (218.1), Ore. (457), Cal. (84.1), Ala. (396), Fla. (337), N.C. (43), Tenn. (464), Ky. (218.1), Va. (271), W.Va. (3.2); Asia (308.1); Eur. (409).

There was a good deal of confusion as to what writers had before them when discussing this species until K. Mueller's work (409) on the genus in 1912. Hence geographic distributions and even drawings cannot always be relied upon.

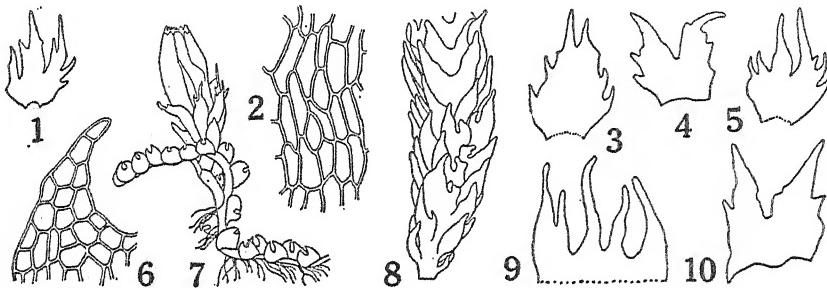
11. *Cephalozia macrostachya*¹³³ Kaal, Revue Bryol. 19:8, 1902.

C. multiflora var. *elata* Spruce, On Cephalozia 38, 1882.

Plants in patches, dark green to yellowish green. Stems 1-2 cm long, prostrate with ascending tip to ascending, strongly flexuous, sparingly branched, without flagella; branches ventral in origin; cross section of stems showing cells much the same in size, the epidermal hardly larger. Rhizoids tufted, numerous, long, colorless. Leaves alternate, quite succulent, distinctly dorsally decurrent, distant to approximate, erect-spreading

¹³³ mäk rö stäk' i ä.

to horizontally-spreading, somewhat dorsally secund, simply 2-lobed, broadly ovate to asymmetrically circular, the ventral margin more strongly arched than the dorsal, 10-16 cells wide, slightly concave; margin entire; lobes commonly unequal with the ventral the larger, nearly straight to slightly connivent, acute, the tip ending in 1-2 single cells; sinus descending about $\frac{1}{2}$ the leaf length, acute to lunate. Cells of the leaf middle 21-30 μ , of the lobes 23-30 μ , of the base 25-40 μ ; walls slightly thickened; trigones wanting or minute; cuticle smooth. Gemmae in spheri-



Cephalozia macrostachya. 1, Female bracteole, x 12.7. 2, Cells near base of leaf, x 124. 3, Female bract, x 12.7. 4, Male bracteole, x 26. 5, Female bract, x 12.7. 6, Leaf lobe, x 124. 7, Part of plant with perianth, x 8.8. 8, About the lower third of a male inflorescence, x 21. 9, Part of mouth of perianth, x 26. 10, Male bract, x 26. (1, 3, 5, after Macvicar; 4, 9-10, after K. Mueller; the others after Jensen.)

cal heads, at the tip of the stem, ovoid or pyriform to angular, 1-celled, greenish white, the surrounding leaves dentate and with dentate underleaves. Underleaves wanting or rarely a few minute ones, present immediately below the heads of gemmae and in association with the female bracts and the bract-like leaves subtending them. Plants unisexual. Male branches ventral in origin, long, the apical portion continuing as an unmodified branch; male inflorescence long, occupying the basal or middle portion of the branch, or all of it, whitish; male bracts 12-40, closely imbricate, larger than the leaves, concave, transversely inserted, 2-lobed for $\frac{1}{2}$ - $\frac{2}{3}$ the length; the lobes narrowly lanceolate, acuminate, dentate to spinose-dentate; male bracteoles present, often almost as large as the male bracts and similar to them; antheridium 1. Female branches ventral in origin, short, modified; female bracts 2-3 times as long as the leaves, broadly ovate to ovate-quadrangular, 2-lobed for about $\frac{1}{2}$ their length; the margins more or less spinose-dentate; the lobes lanceolate, acuminate, entire to somewhat spinose-dentate; the sinus narrow, acute; female bracteole much like the bracts, deeply 2-3-lobed, spinose-dentate. Perianth oblong-ovate or elliptic, somewhat 3-angled especially toward tip, $\frac{2}{3}$ - $\frac{3}{4}$ -emergent, 2 cells thick toward base but otherwise 1 cell thick, slightly and gradually contracted to the mouth; mouth wide, $\frac{2}{3}$ - $\frac{5}{6}$ the width of the perianth, ciliate; the cilia 3-4 cells long. Sporophyte apparently

unknown. The name from Gk. *macros*, large, and *stachys*, botanically a spike; in reference to the long antheridial spikes.—On and among *Sphagnum*.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 17; Macvicar (374) 270, figs. 1-7; Meylan (386) fig. 147; Jensen (323.5) 205, figs. 1-5; Schiffner, *Hedwigia* 54: pl. 11, 1914.

EXAMINATIONS: Conn. Andover (Lorenz) 1911; Berlin (Lorenz) 1915.—*La.* Honey Island swamp near Pearl River (Pennybaker 7) 1937.—Mass. Woods Hole (Greenwood) 1907; Worcester (Greenwood) 1917.—N.H. Mt. Lafayette (Lorenz) 1917.—N.Y. Nepeague on Long Island (Latham 2839) 1927; Southold on Long Island (Latham) 1927.—Vt. Wallingford (Lorenz) 1916.—Va. Bullock Run (Svihla 11) 1925.

TYPE LOCALITY: On the Island of Ramholmen near Fredrikstad, Norway (Ryan) 1898. About Lat. 59° 13' N., Long. 11° 14' E.

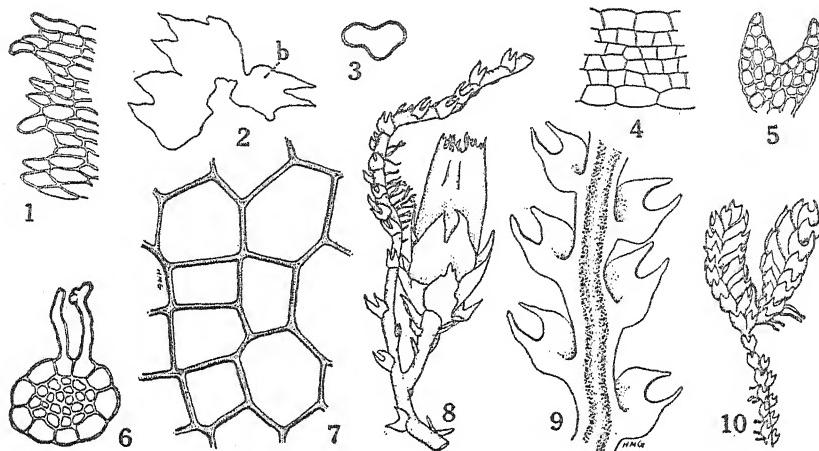
RANGE: Greenland (320), Me. (369.1), N.H. (185), Vt. (185) Mass. (185), R.I. (176), Conn. (176), N.Y. (364), Va., La.; Eur. (374).

12. *Cephalozia leucantha*¹³⁴ Spruce, On *Cephalozia* 68, 1882.

Cephalozia catenulata var. *laxa* Gottsche in Gottsche & Rabenh. Hep. Eur. Exsic. No. 433, between 1862 and 1879, probably about 1870.

Plants in patches or creeping among other bryophytes, whitish green, leafy shoots about 200 μ wide. Stems 0.4-1 cm long, prostrate, much branched, without flagella; branches ventral in origin; cross section of stem showing 10 large thin walled epidermal cells and a group of 16-20 smaller thick walled interior cells. Rhizoids rather few, present to near the tip, short. Leaves alternate, distinctly to indistinctly succubous, not decurrent, distant, erect to erect-spreading, simply 2-lobed, broadly ovate, little wider than the stem is thick, a little longer than wide, 6-8 cells wide; margin entire; lobes narrowly triangular, frequently unequal with the ventral one the larger, 3-4 cells wide at base, acute to acuminate, straight or a little connivent, sinus descending $\frac{1}{2}$ - $\frac{3}{5}$ the leaf length, obtuse to acute. Cells of the leaf middle 12-20 μ , of the lobes the same, of the base 14-24 μ ; walls considerably thickened; trigones none or quite small; cuticle hyaline-papillose. Gemmae at the swollen tips of branches, spherical to ovoid, 1-celled, yellowish green, 12-14 μ , surrounded by leaves much larger than the normal ones of sterile branches. Underleaves wanting except among the female bracts and their subtending bract-like leaves. Plants unisexual. Male plants intermingled with the female, larger than the sterile plants; male inflorescence terminal on a stem or on a short modified ventral branch; male bracts closely imbricate, larger than the leaves, rather numerous, orbicular, very concave, about $\frac{1}{3}$ -bilobed, the dorsal margin with a small tooth, the lobes incurved; antheridium 1. Female branch a very short modified ventral one; female bracts 3-4 times as long as the leaves of the sterile stems, 2-lobed for $\frac{1}{4}$ - $\frac{1}{3}$ their length, rarely irregularly 3-lobed, roundish ovate, entire to subdenteate or

¹³⁴ lü kän' thä.



Cephalosia leucantha. 1, Part of mouth of perianth, x 98. 2, Female bracts and bracteole (*b*), x 16.3. 3, Cross section of perianth above middle, x 17.5. 4, Longitudinal section of stem, x 110. 5, Leaf, x 98. 6, Cross section of stem, x 120. 7, Median leaf cells, x 650. 8, Part of plant with perianth, x 17.5. 9, Part of sterile stem, dorsal view, x 50. 10, Part of plant with 2 male inflorescences, x 16.3. (3, 8, after Evans; 4, 7, 9, original, by Helen Gilkey; the others after K. Mueller.)

sinuate-dentate; the lobes triangular, acute to acuminate; the sinus acute to obtuse or rounded; bracteole irregularly 2-lobed, united with the bracts at base. Perianth cylindric, slightly curved, about $\frac{3}{4}$ -emergent, long, white, somewhat triangular above, gradually narrowed to the mouth; mouth $\frac{1}{3}$ - $\frac{1}{2}$ the width of the perianth, irregularly lobed, the lobes setulose, the setae 1-2 cells long. Sporangium oblong-ovoid, yellowish brown. Elaters about 8μ thick; spirals 2, loosely wound, reddish brown. Spores $8-12 \mu$, finely verruculose, yellowish or reddish brown. The name from Gk. *leukos*, whitish, and *anthos*, flower; in reference to the whitish perianth.—On rotten wood, on wet soil, especially peaty soil; among *Sphagnum*.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 21; Pearson (433) 2: pl. 72; Evans, Proc. Wash. Acad. Sci. 2: pl. 17, figs. 18-26, 1900; Macvicar (374) 273, figs. 1-6; Meylan (386) fig. 150; Jensen (323.5) 215, 3 figs.; Douin, Bull. Soc. Bot. France 55:376, fig. 43, 1908; and 60:485, figs. 64-66, 1913.

EXAMINATIONS: Alaska. Port Chatham (Rigg 1225) 1913.—B.C. Port Renfrew (Gibbs) 1901.—Que. Anticosti Isl. (Victorin 19136) 1915; Grand Rousseau (Victorin 19017) 1917; Sept-Isles (Victorin & Germain 18308) 1924.—Wash. Aberdeen (Foster) 1909.

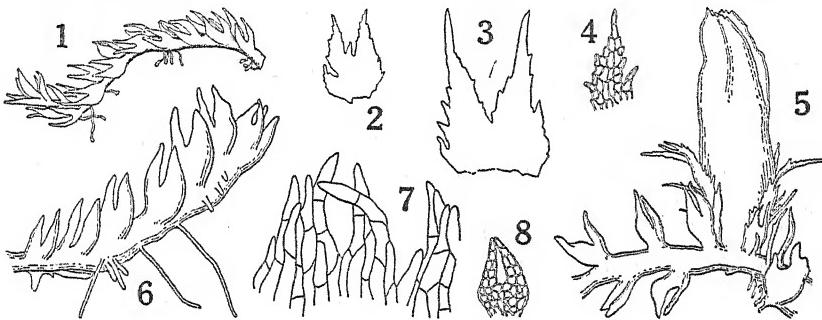
TYPE LOCALITY: In the forest at Feldberg between Menzenschwand and the Feldberg Court in Baden, Germany, at 1250 meters (Jack) 1866.

RANGE: Newfoundland (177), N.S. (413), Que. (96), Yukon (177), Alaska (364), B.C. (177), Wash. (81); Asia (308.1); Eur. (329); Spitzbergen (524.3).

13. *Cephalozia macounii*¹³⁵ Aust. Hep. Bor.-Amer. 14, 1873.

Jungermannia macounii Aust., Proc. Acad. Nat. Sci. Philadelphia 21(1869):222, 1870.

Plants very small, in patches, yellowish green. Stem much branched; branches ventral in origin; cross section of stem showing 10 epidermal cells 12-15 μ wide and 8 interior cells about 8 μ in diameter. Rhizoids few, short, in groups. Leaves alternate, nearly transversely inserted to somewhat succubous, not decurrent, distant to approximate, erect-spreading, simply 2-lobed, ovate; about 200 μ wide, the undivided base 5-8 cells or about 100 μ wide; margin entire; lobes comparatively long and narrow, lanceolate, acute or acuminate, 2-3 cells wide at base, equal or



Cephalozia macounii. 1, Tip of plant, x 32. 2, Female bract, x 28. 3, Female bract, x 95. 4, Tip of lobe of female bract, x 67. 5, Part of plant with perianth, x 41. 6, Tip of plant, x 68. 7, Part of mouth of perianth, x 161. 8, Leaf, x 67. (1-2, 4, 8, after K. Mueller; 3, 5-7, original, by Elizabeth Curtis.)

the ventral the larger, from slightly spreading to straight or somewhat connivent, ending in a row of 2 cells; sinus descending about $\frac{2}{3}$ the leaf length, acute to rounded. Cells of the leaves 12-18 μ ; walls somewhat thickened; trigones small. Gemmae apparently unknown. Underleaves present only between the female bracts and among the bract-like leaves. Plants unisexual. Male inflorescence unknown. Female inflorescence terminal on short modified branch; female bracts about twice as long as the leaves of sterile stems, 2-lobed for about $\frac{1}{2}$ their length, their margins and those of the lobes sharply and irregularly toothed, the dorsal margin with an additional small lobe; the lobes acuminate; bracteole 2-lobed, the lobes lanceolate and entire. Perianth ovoid, plicate above; mouth setulose; the setae numerous, 1-2 cells long. Sporophyte unknown. Named in honor of John Macoun, a Canadian botanist.—On rotten wood.

ILLUSTRATIONS: K. Mueller (409) 2: 781, fig. 206.

EXAMINATIONS: B.C. Shushwap Lake (Brinkman 404) 1908.—Wis. Lake Nehgamain in Douglas County (Conklin 1228) 1913; Wisconsin River (Cheney) 1893.

TYPE LOCALITY: Barlow's Swamp, Belleville, Hastings County, Ontario (John Macoun) May 20, 1865.

RANGE: Me. (409), N.H. (140), Ont. (431), Mich. (213), Wis. (79.3), B.C. (373); Asia (19.05); Eur. (409).

*CLADOPODIELLA*¹²⁶ Buch, Mem. Soc. Fauna Fl. Fennica 1:89, 1925.

Cephalozia subgenus *Eucephalozia* section *Subluridae*¹²⁷ Spruce, On Cephalozia 49, 1882.

Eucephalozia subgenus *Cladopus* Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3):97, 1895.

Cephalozia subgenus *Cladopus* K. Muell., Rabenh. Krypt.-Fl. 6(2):73, 1912.

Cladopus Meylan, Les Hepaticae de la Suisse 203, 1924.

Plants green to brownish or reddish violet. Stems 0.5-8 cm long, with numerous flagella, usually branched; epidermal cells not strongly pellucid; branches ventral in origin; cross section of stem showing 14-20 epidermal cells. Rhizoids numerous or moderately so, in groups. Leaves alternate, nearly transverse to distinctly succubous, not decurrent, distant to imbricate, erect-spreading to horizontally spreading, occasionally somewhat dorsally secund, simply 2-lobed; margin entire to sinuate; lobes equal or usually unequal with the ventral the larger, acute to rounded; sinus descending $\frac{1}{6}$ - $\frac{1}{3}$ the leaf length, acute to rounded; cells of the leaf middle 20-42 μ ; walls slightly thickened; trigones wanting; oil bodies 2-6 per cell; cuticle smooth or finely granulate. Underleaves scarce to moderately so but present in the male and female inflorescences. Plants unisexual. Male inflorescence terminal on a short ventral branch, or either terminal or intercalary on a main stem; male bracts 8-20, smaller than the sterile leaves; antheridia 1 per bract. Female inflorescence on a short ventral branch; female bracts larger than the leaves of sterile stems, united with each other, longer than wide, entire or with one or few marginal teeth, 2-lobed to about $\frac{1}{4}$ - $\frac{1}{3}$, the lobes acute, the bracteole not or hardly united with the bracts, 2-lobed, smaller than the bracts. Perianth free from the bracts, $\frac{3}{4}$ - $\frac{7}{8}$ -emergent, not fleshy, bluntly 3-angled with one of the angles dorsal, acutely narrowed to the mouth; mouth $\frac{1}{5}$ - $\frac{1}{3}$ the diameter of the perianth, sinuate to lobed, also crenulate. Seta 4 cells thick, the epidermal cells larger than the interior ones. Sporangial wall 2-3 cells thick; epidermal cells with nodular thickenings; innermost cells with semiannular thickenings. Elaters with 2 spirals. Spores 10-25 μ . The name from Gk. *klados*, branch, and *podos*, feet or bases, and the L. diminutive *-ella*; in reference to the branched rhizome-like bases of the plants.

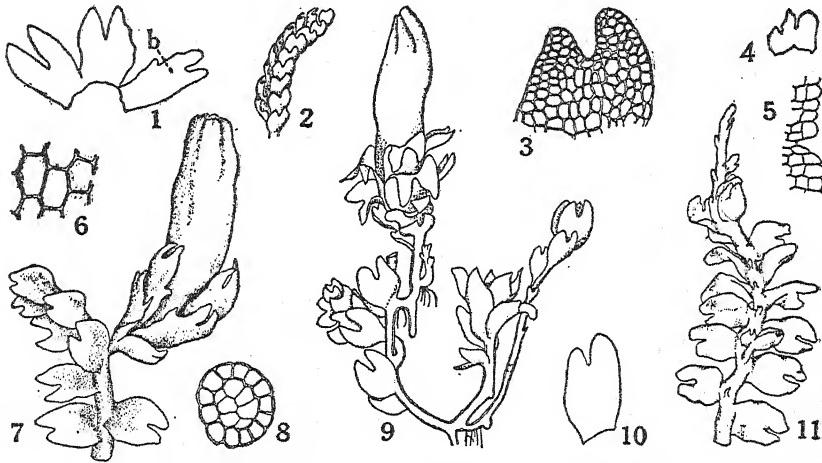
- | | |
|--|--------------------------|
| Leaves of normal sterile stems with median cells 35-42 μ , the
leafy shoots 1-2 mm wide..... | 2. <i>C. francisci</i> . |
| Leaves of normal sterile stems with median cells 20-25 μ , the
leafy shoots 500-777 μ wide..... | 1. <i>C. fluitans</i> . |

¹²⁶ klā" dō pō dī ēl' lä. While *Cladopus* would have been the natural genus name, it is antedated by a genus *Cladopus* in the flowering plants (see K. Mueller, Ann. Jord. Bot. Buitenzorg, Ser. 2, 1:115-132, 1899).

¹²⁷ Spruce comments on the naming of his *subluridae* group *Cladopus* subgenus, but he does not so classify it, leaving it with the section *Subluridae*.

1. *Cladopodiella fuitans*¹⁸⁸ (Nees) Joerg., Bergens Mus. Skrift. 16:276, 1934.*Jungermannia fuitans* Nees Syll. Ratisbon 129, 1823, exclusive of synonyms.*Jungermannia inflata* f. *fuitans* Nees Naturg. Eur. Leberm. 2:43, 1836.*Cephalozia obtusiloba* Lindb., Bot. Not. 164, 1872.*Cephalozia fuitans* Spruce, On Cephalozia 50, 1882.*Cephalozia francisci* var. *fuitans* Aust. in Underw. Cat. N. Am. Hep. 96, 1884.*Eucephalozia fuitans* Schiffn., Engler & Prantl Nat. Pfl.-Fam. 1(3):97, 1895.*Lophozia fuitans* Bouly Muscinees de la France 2:104, 1904.

Plants in tufts or scattered among *Sphagnum*, green to brownish or reddish violet; leafy shoots 1-2 mm wide. Stems normally 3-8 but sometimes as much as 20 cm long, creeping to ascending or rarely erect, with few or no branches, with flagella; flagella leafless or distantly small-leaved; branches ventral in origin, often naked or flagelliform at base; cross section of stem showing 13-16 opaque epidermal cells, and slightly smaller pellucid interior ones. Rhizoids rather numerous below and on the flagella, scarce to almost none on the upper parts of the plant, in groups, colorless. Leaves alternate, distinctly succubous, not decurrent, distant to subimbricate, erect-spreading to horizontally spreading, sometimes dorsally subsecund, simply 2-lobed, asymmetrically elliptic; margin entire; lobes ovate, unequal with the ventral often distinctly the larger, obtuse to rounded; sinus descending $\frac{1}{5}$ - $\frac{1}{3}$ the leaf length, narrow, acute to rounded. Cells of the leaf middle in land plants 35-42 μ , of the lobes 30-35 μ , of the base



Cladopodiella fuitans. 1, Female bracts and bractole (*b*), x 16. 2, Male inflorescence, x 10.6. 3, Leaf cells, x 48. 4, Male bract, x 13.2. 5, Part of mouth of perianth, x 64. 6, Leaf cells, x 127. 7, Plant with perianth, x 12.7. 8, Cross section of seta, x 48. 9, Plant with perianth, x 16. 10, Leaf, x 10.6. 11, Ventral view of plant, x 7.1. (11, after Steere; 5, 6, 7, after Macvicar; the others after K. Mueller.)

¹⁸⁸ flū' i tāns.

38-45 μ ; in water plants the cells larger; walls slightly thickened; trigones none; oil bodies 4-6 per cell; cuticle smooth. Gemmae unknown. Under-leaves always present but not throughout, rare on submerged plants, small, appressed to the stem or nearly so, unequally 2-toothed to entire, linear-subulate to lanceolate. Plants unisexual. Male inflorescence on short ventral branches, or terminal or intercalary on the main stem; male bracts 10-20, closely imbricate, smaller than the leaves, quite concave, 3-lobed, or 2-lobed with a tooth on the dorsal margin; male bracteole distinct, shortly lanceolate; antheridium 1. Female inflorescence on short ventral modified branch; female bracts about twice as long as the leaves, quite concave, 2-lobed for $\frac{1}{4}$ - $\frac{1}{3}$ their length, with a tooth about the middle of one or both margins; the lobes lanceolate, acute; the sinus very narrow, acute; female bracteole similar to the bracts, free. Perianth oblong or cylindric, 3-4 mm long, about $\frac{3}{4}$ -emergent, 3-4 cells thick at the base, 2-3 cells thick above the middle, obtusely 3-angled above, acutely contracted to the mouth; mouth $\frac{1}{5}$ - $\frac{1}{3}$ as wide as the perianth, sinuate, somewhat crenulate by projecting cells. Seta up to 2 cm long and 250 μ thick, tender; in cross section composed of unlike epidermal and interior cells; epidermal cells 14-15, large, rather thickly walled; the interior cells of the same size as the epidermal ones, quite thin walled, soon breaking down and leaving a central hollow in the seta. Sporangium ellipsoid, about 1 mm long, dark brown, wall 2-3 cells thick; epidermal cells with irregular nodular thickenings on the longitudinal walls; innermost layer with irregular semiannular thickenings. Elaters 120-200 μ long, 7-9 μ thick, spirals 2, tightly wound, dark brown. Spores 15-25 μ , very finely and densely roughened, dark purple. The name the *L. fluitans*, swimming; because the water form of the species was first found.—In pools and bogs; creeping among *Sphagnum*.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 23; Pearson (433) 2: pl. 63; Macvicar (374) 276, figs. 1-5; Jensen (323.5) 201, 3 figs.; Warnstorff (523) 184, fig. 2; Meylan (386) fig. 38, A-C; Steere (485.5) 66, figs. 10-13; Ammons (3.1) 137, fig. E; Douin, Bull. Soc. Bot. France 55:376, 1 fig., 1908.

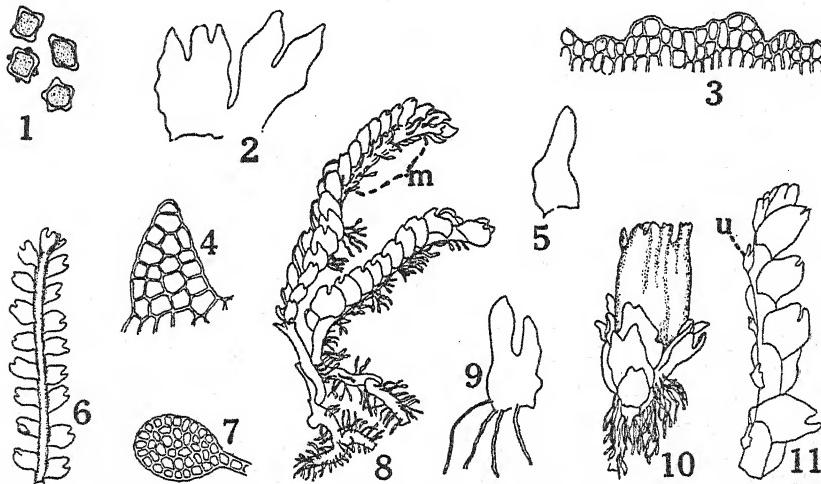
EXAMINATIONS: Me. Mt. Desert (E.L. Rand 173) 1893.—Mich. Cheboygan (Woollett) 1923.—N.H. Franconia Mts. (Evans) 1908.

TYPE LOCALITY: In the "Riesengebirge auf der Weissen Wiese bei der Schnee Koppe" in what is now Germany (Funk).

RANGE: Labrador (510), Miquelon Isl. (431), Anticosti Isl. (431), N.S. (413), Me. (369.1), N.H. (359), Vt. (168), Mass. (176), R.I. (159), Conn. (140), N.Y. (13.1), Que. (178), Ont. (373), Ohio (476), Mich. (418), Minn. (212), W.Va. (3.2), N.J. (29), B.C. (373), Wash. (212); Asia (308.1); Eur. (409).

2. *Cladopodiella francisci*¹³⁹ (Hook.) Joerg., Bergens Mus. Skrift. 16:274, 1934.*Jungermannia francisci* Hook. Brit. J. Bot. pl. 49, 1816.*Jungermannia schlmeyeri* Hueben. Hep. Germ. 156, 1834.*Cephalozia francisci* Dum. Rec. d'Obs. 18, 1835.*Trigonanthus francisci* Hartm. Skand. Fl., Ed. 10, 2:142, 1871.*Cephalozia schlmeyeri* Cogn. Monog. Hep. Belgique 35, 1872. In Bull. Soc. Roy. Bot. Belgique.*Cephalozia borealis* Lindb., Medd. Soc. Fauna Fl. Fennica 14:65, 1888.*Jungermannia binderi* Velenovsky, Jatrovsky Ceske 1:27, 1901.*Cladopus francisci* Buch, Acta Soc. Fauna Fl. Fennica 55(6):6, 1925.

Plants in patches, green to reddish brown; leafy shoots 500-700 μ wide. Stems 3-8 mm long, creeping, with ascending or erect branches, with flagella; branches ventral, several, often leafless at base; flagella leafless. Rhizoids numerous especially on the flagella. Leaves alternate, distinctly succubous to almost transversely inserted, not decurrent, distant to imbricate, erect-spreading to horizontally spreading, often dorsally secund, simply 2-lobed, broadly ovate to elliptic, concave; margin entire or the dorsal sometimes sinuate; lobes triangular, often unequal with the larger one ventral, acute to rounded, incurved; sinus descending $\frac{1}{6}$ - $\frac{1}{5}$ the leaf length, narrow, acute to rounded. Cells of the leaf middle 20-25 μ , of the lobes 17-23 μ , of the base 25-35 μ ; walls somewhat thickened; trigones none; oil bodies 2-5 per cell; cuticle finely granulate. Gemmae in clusters, at the tips of the branches and sometimes on the underleaves, mostly



Cladopodiella francisci. 1. Four gemmae, x 141. 2. Female bracts, x 35. 3. Part of mouth of perianth, x 106. 4. Lobe of leaf, x 124. 5. Underleaf, x 71. 6. Sterile shoot, x 14.1. 7. Cross section of stem, x 71. 8. Plant with male (*m*) inflorescence, x 14.1. 9. Underleaf and rhizoids, x 71. 10. Tip with perianth, x 14.1. 11. Tip of sterile shoot with underleaves (*u*), x 8.8. (4, 11, after Jensen; 7, after Gil; the others after K. Mueller.)

¹³⁹ frän sis' ki. Joergensen spells it *francisi*, but Hooker and all other authors up to Joergensen were uniform in spelling it as we do.

3-angled to stellate but some ellipsoid, 1-2-celled, colorless to wine-red. Underleaves common, large, much smaller than the leaves, almost appressed to erect-spreading, oblong to lanceolate, entire to 3-lobed. Plants unisexual. Male inflorescence terminal on short ventral branches or intercalary on branches from the basal region; male bracts 8-12, much like the leaves in form and size, very concave, closely imbricate, often with a tooth at base; antheridium 1. Female inflorescence on short modified ventral branch; female bracts about twice as long as normal leaves of sterile stems, 2-lobed to about $\frac{1}{3}$ their length; margin entire or with an extra lobe or a tooth on 1-2 sides; lobes ovate to oval, obtuse; sinus narrow, acute; bracteole similar to the bracts, united with them at base. Perianth narrowly ovoid to almost cylindric, obtusely 3-angled below, 4-6-plicate toward tip, $\frac{3}{4}$ - $\frac{7}{8}$ -emergent, several cells thick near base, gradually narrowed to mouth; mouth $\frac{1}{4}$ - $\frac{1}{3}$ the width of the perianth, hyaline, irregularly lobed, the lobes crenulate. Sporangium ovoid, reddish brown; epidermal cells with nodular thickenings; inner wall layer with semiannular thickenings. Elaters with 2 spirals; spirals wide, reddish brown. Spores 10-15 μ , papillose, brown. So named in honor of Rev. R. B. Francis, who first found the species.—On sandy peaty soil, on moist banks.

ILLUSTRATIONS: Hooker (285) pl. 49; K. Mueller (409) 2; fig. 22; Pearson (433) 2: pl. 62; Gil (76) figs. 281-282; Macvicar (374) 275, figs. 1-6; Jensen (323.5) 195, 4 figs.; Meylan (386) fig. 138, D-F; Warnstorff (523) 222, fig. 7

EXAMINATIONS: Mass. Granville (Annie Lorenz) 1917.—N.H. Waterville (Annie Lorenz) 1913.—N.Y. Southold (Roy Latham 56) 1914.—Que. Rupert River (Lepage & Dutilly 4465) 1943.

TYPE LOCALITY: About Holt and Edgefield, England (Rev. R. B. Francis). Holt is in Norfolk, about Lat. $52^{\circ} 56' N.$, Long. $1^{\circ} 6' E.$

RANGE: N.S. (177), Me. (254), N.H. (205), Mass. (203), N.Y. (61); Eur. (325).

*NOWELLIA*¹⁴⁰ Mitt., in Godman's Nat. Hist. Azores 321, 1870.

Cephalosia Dum. Rec. d'Obs. 18, 1835, in small part.

Plants green to reddish purple. Stems prostrate with ascending branches, without flagella, pellucid; branches ventral in origin. Rhizoids few, colorless. Leaves alternate, nearly transversely inserted but succous, not decurrent, simply 2-lobed, obliquely ovate, or obovate by spreading lobes, quite concave to almost hemispherically so, ventral half larger than the dorsal; margins entire, the ventral one much the more convex and its margin incurved to form a sac-like cavity; base narrow; lobes ending each in a long incurved cilium; sinus rounded. Gemmae on the stem tips, spherical to elliptic, 1-2-celled, colorless. Underleaves wanting except in the female inflorescence. Plants usually unisexual but occasionally bisexual. Male inflorescence terminal on a short modified ventral branch, or intercalary in a series on an ordinary elongate branch; male

¹⁴⁰ nō wēl' li ā.

bracts smaller than the leaves, 2-lobed; antheridium 1. Female inflorescence on a short modified ventral branch, or terminal on an ordinary shoot; female bracts larger than the leaves, 2-lobed; bracteole free from the bracts. Perianth cylindric, 3-angled at least above, with one angle dorsal, but little contracted to mouth; mouth wide, ciliate. Seta elongate. Sporangium ovoid. Named in honor of John Nowell, a botanist of Yorkshire, England.

1. *Nowellia curvifolia*¹⁴¹ (Dicks.) Mitt., in Godman's Nat. Hist. Azores 321, 1870.

Jungermannia curvifolia Dicks. Pl. Crypt. Fasc. 2:15, 1790.

Jungermannia baueri Mart. Fl. Crypt. Erlangensis 172, 1817.

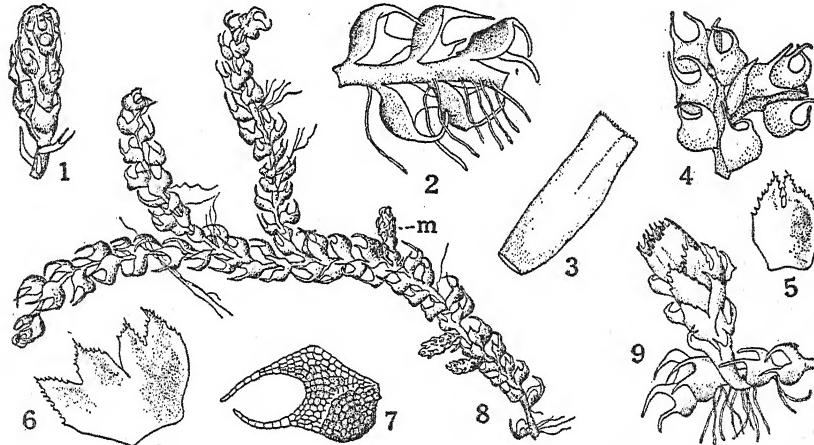
Jungermannia curvifolia var. *baueri* Lindenb. Syn. Hep. 92, 1829.

Cephalozia curvifolia Dum. Rec. d'Obs. 18, 1835.

Trigonanthus curvifolius Spruce, Hartm. Skand. Fl., Ed. 10, 143, 1871.

Cephalozia curvifolia var. *baueri* Dum. Hep. Eur. 93, 1874.

Plants in patches, green to brownish or reddish purple; leafy shoots about 1 mm wide. Stems 1-2 cm long, prostrate, simple or with ascending branches without flagella, slender, pellucid, flexuose; branches ventral in origin. Rhizoids rather few, colorless, long, hardly tufted. Leaves alternate, succubous but almost transversely inserted, not decurrent, loosely imbricate, erect-spreading to spreading, dorsally secund, simply 2-lobed, obliquely obovate, about 25 cells wide, strongly concave, narrow at base; margins entire, the dorsal one somewhat convex, the ventral one much more strongly convex with the basal portion strongly incurved and mak-



Nowellia curvifolia. 1, Male inflorescence, x 21. 2, Part of stem, ventral view, x 21. 3, Perianth, x 10. 4, Part of plant, x 17. 5, Female bracteole, x 12.7. 6, Female bracts, x 12.7. 7, Leaf, showing saccate ventral base, x 21. 8, Plant with three male (m) branches on basal half, x 6.8. 9, Ventral female branch with young perianth, x 10.6. (3, 5, 6, after Pearson; 4, after Evans; the others after K. Mueller.)

¹⁴¹ kür vi fō' li ā.

ing a sac-like hollow; lobes unequal, the ventral one the larger, triangular at base and ending each in a long incurved cilium 4-10 cells long; sinus descending $\frac{1}{2}$ - $\frac{3}{5}$ the leaf length, rounded. Cells of the leaf middle 17-24 μ , of the cilia longer, of the base 20-30 μ ; walls rather thick; trigones none; cuticle smooth, but finely papillose at the tips of the lobes. Gemmae at the stem tips, globose-ellipsoid, 1-celled, colorless. Underleaves wanting except in the female inflorescence. Plant usually unisexual but rarely bisexual. Male plants usually in separate patches, more tenuous, their leafy shoots only about half as wide as the sterile shoots; male inflorescence terminal on short ventral branches, or several successive ones down an otherwise little modified and elongate stem or ventral branch; male bracts 8-12, 2-lobed, smaller than the leaves of sterile shoots and the cilia of their lobes shorter, very concave, the dorsal margin with one tooth; antheridium 1. Female inflorescence on short modified ventral branch, or terminal on an ordinary elongate shoot; female bracts about 5 times as long as the leaves of sterile shoots, ovate, 2-lobed to $\frac{1}{3}$ their length, without the sac-like lobe as in the leaves; margin up to the lobes entire or with some teeth; the lobes dentate-serrate to spinose-ciliate, sharply acuminate; the sinus acute; bracteole similar to the bracts, free. Perianth cylindric but 3-angled especially in the upper part, large, $\frac{1}{2}$ - $\frac{3}{4}$ -emergent, gradually and comparatively little narrowed to the mouth; mouth wide, about $\frac{1}{2}$ the diameter of the perianth, spinose-ciliate, the cilia 3-4 cells long. Seta elongate, 6-8 mm long. Sporangium broadly oval, reddish brown. Elaters about 12 μ thick; spirals 2, reddish brown. Spores 7-9 μ , yellowish brown to reddish brown. The name from *L. curvus*, a curve, and *folius*, a leaf; in reference to the almost hemispherically incurved leaves.—On rotten wood; on moist peat; on soft sandstone.

ILLUSTRATIONS: K. Mueller (409) 2: figs. 24-25; Ekart (124) pl. 8, fig. 59; Pearson (433) 2: pl. 61; Meylan (386) fig. 139; Macvicar (374) 278, figs. 1-3; Jensen (323.5) 205, 2 figs.; Gil (76) fig. 284; Hooker (285) pl. 16; Steere (485.5) 62, figs. 1-3; Ammons (3.1) 137, fig. D.

EXAMINATIONS: *Ind.* The Shades, Montgomery County (Drexler 1041) 1936; Turkey Run State Park (Drexler 1133, 1149) 1937.—*N.Y.* Little Moose Lake in Herkimer County (Haynes 2093) 1923; Shushan (Lorenz) 1911.—*Ont.* Belleville (Macoun) 1866; Quetico National Park (Drexler 442) 1935.—*Vt.* Jamaica (Lorenz) 1911.

TYPE LOCALITY: Great Britain.

RANGE: Newfoundland (212), Anticosti Isl. (373), Prince Edward Isl. (373), N.S. (53.2), N.B. (369), Me. (369.1), N.H. (359), Vt. (140), Mass. (226), R.I. (169), Conn. (140), N.Y. (336.05), Que. (178), Ont. (373), Pa. (337.09), Ind. (512.1), Mich. (104.01), Ill. (529), Ind., Wis. (79.3), Minn. (94.1), Ky. (218), Tenn. (40.5), Ga. (505), N.C. (480), Va. (127), W.Va. (386.5), Md. (282), D.C. (343); Mex. (224); Asia (458); Africa (476)¹⁴²; Azores (2.075); Madeira (325); Eur. (325).

¹⁴² Spruce says that according to the authors of *Syn. Hep.* it has been found in S. Africa, but we find no mention of its African occurrence in G. L. & N. *Syn. Hep.*

Macvicar expresses doubt whether Hooker's (285) plate 16 is all this species. It seems to us, however, that outside of the first 3 figures it is merely poorly drawn. The detail of margin of female bract and of mouth of perianth is simply not there.

K. Mueller (409) says the female bracts are free. Pearson (433) says they are united, and illustrates them so (pl. 61). This point needs further observation.

CEPHALOZIELLOIDEAE¹⁴³

Plants very small. Stems 1-15 mm long, in cross section the cells all very similar. Leaves alternate, transversely to slightly succubously inserted but in a few quite succubous, not decurrent, distant to imbricate, simply 2-lobed; margins entire to dentate; lobes equal or the ventral one inclined to be the larger. Gemmae rather commonly present, 1-2-celled, usually more or less elongate. Underleaves from wanting or rudimentary to present throughout. Plants unisexual or bisexual. Female bracteole in most species united with both bracts for part of its length, more rarely with only one, or quite free. Perianth normally 4-5-angled with one dorsal, two lateral and a single or double one ventral; mouth from not lobed to shallowly so. Seta without a fibrous strand, hyaline, in cross section (when young) composed of 4 large epidermal cells and 4 very much smaller interior ones, the interior ones soon disintegrating so that usually only the four epidermal cells are found. Sporangium ellipsoid, with large hyaline cells at base; valves 4.

The general level of advancement seems to be about that of the Nardoideae. We conceive it possibly related to that group through some member with seta few cells thick. Unfortunately the structure of the setae in the Nardoideae is mostly unknown. What holds the Cephalozielloideae together is chiefly the 4 cells in the cross section of the mature seta.

This group needs study perhaps more than any of those common in the north temperate zone. If any phylogenetic grouping made on the basis of our present knowledge withstands the test of time, it will be mere accident, for the morphological facts are not yet sufficiently known. The reasons are evident. (a) It is a group composed chiefly of small inconspicuous plants and therefore rarely gathered. (b) They intergrade much in the characters Douin used to separate them, and Douin's (117.2 and 117.25) accounts are still the best and most usually followed. (c) The first generic distinction is based upon the gemmae, and gemmae are apparently unknown or undescribed in almost half of our 32 species and varieties. (d) The second generic criterion by Douin is the amount of union between female bracts and bracteoles. This is very variable among the species of *Cephaloziella*. (e) With few exceptions the variations and intergradations remain largely unknown.¹⁴⁴ (f) It usually requires a number

¹⁴³ sēf à lō" zí ēl lō" dē ē.

¹⁴⁴ If only two collections of dogs were known, one a rat terrier and the other a greyhound, they would probably be described as separate species.

of collections to get the morphology of all the organs of reproduction and of the sporophyte. So the gaps in our knowledge are likely to be in exactly those parts which are the most likely to show phylogenetic relationships. We consider the comparison on the folding chart here inserted far better than a key only.

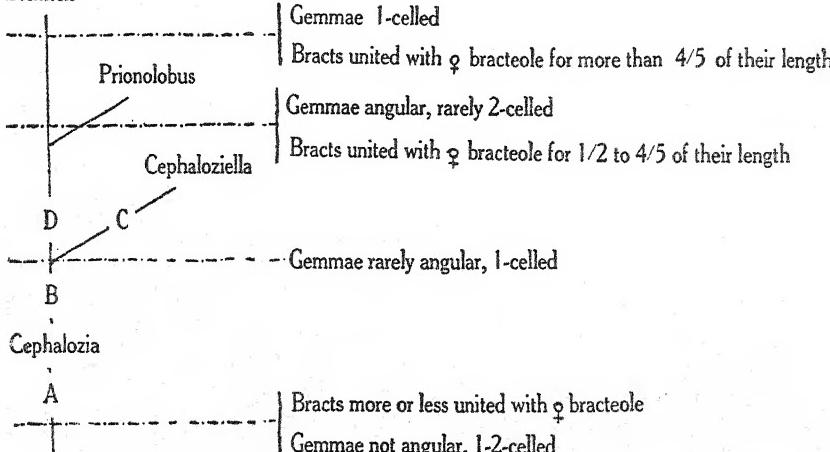
- A. Gemmae angular due to projecting angles or points.
- B. Involucre 7-8-lobed to cup-like with the margin only obscurely lobed.
 - Dichiton, p. 558
- BB. Involucre 5-6-lobed *Prionolobus*, p. 556
- AA. Gemmae ovoid, smooth; involucre coarsely 5-6-lobed or of separate bracts and bracteole *Cephaloziella*, p. 509
 - a. Backs of some of the leaves more or less papillose due to projecting cells or rows of cells Subgenus *Papillosae*, p. 509
 - aa. Backs of leaves not papillose or the papillae merely thickened points of cell wall.
 - b. Plants unisexual Subgenus *Byssacae*, p. 517
 - bb. Plants bisexual.
 - c. Male bracts on same shoot as female bracts... Subgenus *Stelluliferae*, p. 527
 - cc. Male inflorescence on separate shoots beneath the female inflorescence.
 - d. Bracteole free from the female bracts..... Subgenus *Elachistae*, p. 537
 - dd. Bracteole united with one or both bracts... Subgenus *Hampaeae*, p. 542

RELATIONSHIPS AMONG NORTH AMERICAN CEPHALOZIELLOIDEAE

The statements under the letters below are pertinent at the corresponding letters on the diagram below.

- (A) Underleaves rare on sterile stems; branches ventral. Seta when mature of 8 epidermal and 4 interior cells.
- (B) Seta when mature of 4 rows of cells.
- (C) Underleaves none to present throughout; branches ventral or rarely lateral.
- (D) Underleaves wanting or rare on sterile stems; branches lateral or rarely ventral.

Dichiton



Phylogenetic diagram of North American Cephalozielloideae

*CEPHALOZIELLA*¹⁴⁵ (Spruce) Schiffn, in Engler & Prantl Nat. Pfl.-Farm. 1(3):98, 1895; emend. K. Müell. in Rabenh. Krypt.-Fl. 6(2):786, 1916.

Cephalozia Spruce, On Cephalozia 62, 1882, largely.

Plants green to reddish or brownish; leafy shoots 0.1-1 mm wide. Stems 0.5-10 mm long, prostrate or the branches ascending to erect; branches wanting to numerous, ventral, or lateral in origin. Rhizoids few to numerous, colorless or brownish. Leaves alternate, transversely or somewhat succubously inserted, in *C. obliqua* very succubous, in some species dorsally papillose by projecting cells or short rows of cells; those on sterile shoots usually distant, simply 2-lobed, erect-spreading to spreading, margin entire to dentate, lobes 2-14 cells wide and equal or the ventral one the larger, sinus descending $\frac{1}{3}$ - $\frac{3}{4}$ the leaf length; those near the female bracts imbricate, larger, more inclined to marginal dentation. Leaf cells 7-48 μ ; walls thin to quite thick; trigones wanting to rather large but never bulging; cuticle smooth, or papillose by thickenings of the wall. Gemmae 1-2-celled, spherical to ovoid, without projecting angles. Underleaves wanting to present throughout. Plants unisexual; or bisexual with the male inflorescence on the same stem as the female or on separate branches from below the female inflorescence. Female bracts united with the bracteole in most species. *Cephaloziella* is the diminutive of *Cephalozia*, the genus from which most of the species of *Cephaloziella* were segregated.

The best criteria for relationships appear to be: (a) union between parts of the involucr, which is not well enough known; (b) origin of the branches, which needs much careful observation; (c) perhaps minor differences in the gemmae, which are not well observed; (d) relation of male inflorescence to female one, which is not usually of much phylogenetic value among leafy hepaticae. The number of cells in width of the lobes of the leaves is a character which has been given too much weight for its value. The grouping of species herein is chiefly for convenience. In many species collections have been so few that species limits should be considered undetermined.

PAPILLOSAE¹⁴⁶

Backs of the leaves more or less papillose with projecting cells or rows of them; our plants unisexual so far as known.

In place of a key, compare numbers 1-4 on folding chart following page 508.

1. *Cephaloziella papillosa*¹⁴⁷ (Douin) Schiffn. Bryologische Fragmente 25, in Oesterr. Bot. Zeitschr. 55: in 1905.

Cephalozia asperifolia C. Jens., Medd. om Groenland 15:371, 1897. Not of Steph., Bull. Herb. Boissier, Ser. 2, 8:508, 1908; and Sp. Hep. 3:338, 1908, which is *Jungermannia asperifolia* Tayl., London Jour. Bot. 5:277, 1846.

¹⁴⁵ sēf" à lō zī ēl' lā.

¹⁴⁶ pă pil lō' sē.

¹⁴⁷ pă pil lō' sā.

Cephalozia divaricata var. *scabra* Howe, Mem. Torr. Bot. Club, 7:129, 1899.

Cephalozia papillosa Douin, Revue Bryol. 28:72, 1901.

C. douini Schiffn. Bryologische Fragmente 25, in Oesterr. Bot. Zeitschr. 55: 5 of reprint, 1905.

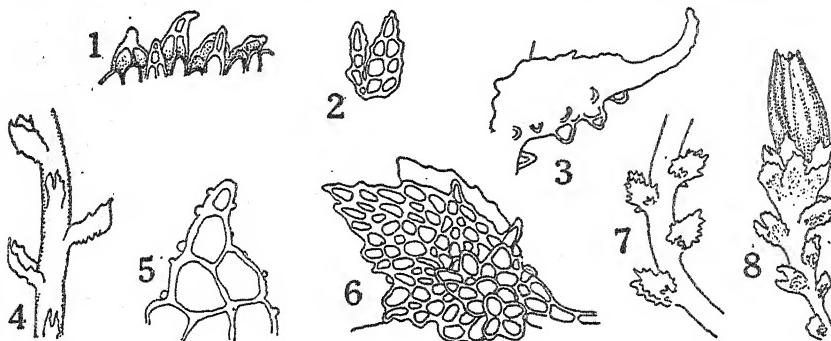
Cephalozia asprella Steph., Bull. Herb. Boissier, Ser. 2, 8:507, 1908; and Sp. Hep. 3:337, 1908.

C. byssacea var. *asperifolia* Macv. Student's Handb. Brit. Hep., Ed. 1, 275, 1912.

C. starkei var. *asperifolia* Macv. Student's Handb. Brit. Hep., Ed. 2, 283, 1926.

C. starkei var. *scabra* Clark & Frye, Publ. Puget Sound Biol. Sta. 6:100, 1928.

Plants in patches, dark green to brownish. Stems 3-10 mm long, prostrate to ascending, rigid, brittle, with numerous ventral branches especially near the perianth, rarely with paraphyllia-like appendages; epidermal cells isodiametric, about 11-18 μ , with thick wall and distinct trigones. Rhizoids rather scarce except below the inflorescence where frequently



Cephaloziella papillosa. 1, Outgrowths from back of leaf, x 446. 2, Underleaf, x 148. 3, Leaf, side view, x 148. 4, Part of sterile shoot, ventral view, x 56. 5, Tip of leaf showing papillae composed of wall substance, x 847. 6, Leaf, attached, x 148. 7, Part of a stem, dorsal view, x 39. 8, Tip of plant with perianth, x 21. (1, 4-5, after K. Mueller; the others after Jensen.)

numerous and long. Leaves alternate, transversely inserted, not decurrent, distant except on the upper part of the female branch, spreading to erect-spreading, simply 2-lobed, almost square in general outline, slightly wider than long, about twice as wide as the stem, with coarse papillae on back formed by projecting cells; dorsal papillae composed of one or more cells, often 2-3 cells high at base of leaf, their terminal walls much thicker; margins dentate; lobes lanceolate, acute, 7-8 cells wide at base, at apex 1 cell wide for 1-3 cells; sinus descending $\frac{1}{2}$ - $\frac{3}{4}$ the leaf length, acute to obtuse. Cells of the leaf middle roundish quadrate, 8-12 μ but averaging about 8.5 μ , of the margin at base about the same; walls moderately thick; trigones wanting to minute; cuticle with numerous small distinct papillae due to thickening of the wall in spots on the dorsal cellular papillae and on ordinary leaf cells. Gemmae ovoid, 1-celled, 9-11 μ long, green. Underleaves present throughout, or here and there on portions of

the stem rudimentary or wanting, oval to lanceolate, usually 2-lobed, more or less denticulate, usually without coarse cellular surface papillae. Plant unisexual. Male inflorescence terminal on ordinary shoots; male bracts strongly concave, spinose-dentate, usually without coarse cellular papillae; male bracteole quite evident, dentate. Female bracts larger than the leaves, 2-lobed for about $\frac{1}{3}$ their length, coarsely dentate; usually with many fewer coarse cellular papillae on the back than the leaves or no such papillae at all; bracteole united with the bracts¹⁴⁸ for about $\frac{1}{2}$ its length. Perianth about $\frac{2}{3}$ -emergent, deeply 3-6-plicate, 2-cells thick at base, gradually contracted to mouth; mouth about half as wide as the perianth, somewhat lobed, crenulate. Spores 5-6 μ , smooth. The name the *L. papillosus*, having small nipple-like projections; in reference to the large cellular papillae on the backs of the leaves.—On logs in deep woods; on rocks.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 53; Jensen, Medd. om Groenland 15:372, figs. 1-5, 1897; Gil (76) fig. 271g; Douin, Soc. Bot. France, Mem. 29: pl. 8, fig. 76, 1920; Douin, Revue Bryol. 28:71, figs. 7-8, 1901.

EXAMINATIONS: Ariz. Parker Creek Experimental Forest (Little 4512) 1937.—Cal. Tuna Canyon, Los Angeles County (MacFadden 7139) 1931.—Ida, Eastport (Rakestraw) 1937.—Ont. Locality not given (Drexler 424) 1935.—Ore. Clear Lake (Rakestraw) 1936; Reedsport (Frye) 1935.—Wash. Washougal (Rakestraw) 1934.

TYPE LOCALITY: Hekla-Havn, Scoresby Sound, Greenland. The Sound is about Lat. 70° 30' N., Long. 25° 0' W.

RANGE: Greenland (320), Mass. (168), Conn. (168), Ont., Ida., B.C. (51), Wash. (81), Ore. (263), Cal. (296), Ariz. (354.02), N.C. (43); Eur. (374).

The antheridia are not described and we saw no mature ones.

1a. *Cephaloziella papillosa* var. *heterophylla*¹⁴⁹ (Haynes) n. comb.

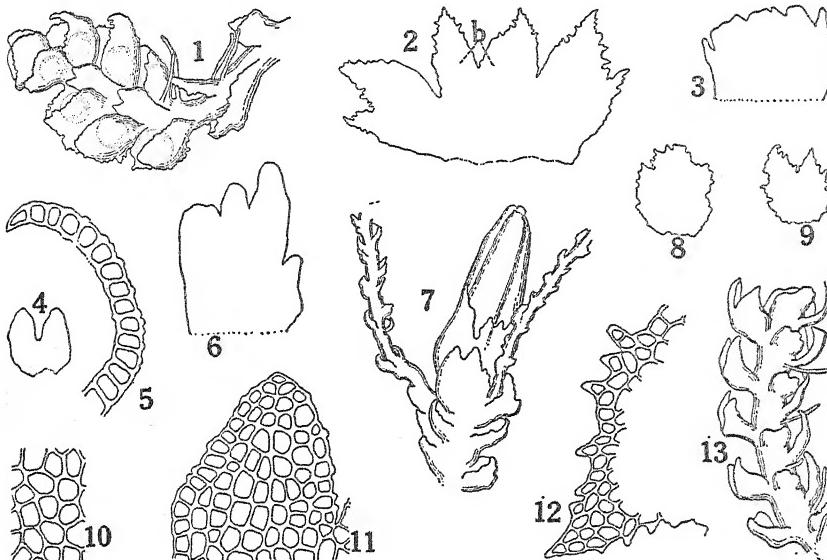
C. starkii var. *heterophylla* Haynes, Ann. Bryol. 11:85, 1938. Not *Cephalozia heterophylla* Steph. Sp. Hep. 6:442, 1924.

Stems 1-5 mm long. Leaves or at least some on each plant with large coarse cellular dorsal papillae; margins dentate or on the lower leaves of sterile shoots sometimes nearly entire; lobes commonly 5-12 cells wide at base but usually 10-12 cells; sinus descending about $\frac{3}{4}$ the leaf length; cells of the leaf middle 6-15 μ ; walls thick; trigones large but not bulging, making the cell cavity roundish; cuticle with some papillae due to thickened spots of cell wall. Gemmae spherical; reddish. Underleaves present throughout, not rudimentary, often wider than long, unlobed to several-lobed or the lobes small enough to be considered teeth. Plants unisexual. Male plants more delicate; antheridium 1, large, 80-95 μ in diameter, about half as long as the male bract. The name from Gk. *heteros*, different, and *phyllon*, leaf; in reference to the occurrence of leaves both with and

¹⁴⁸ K. Mueller (409) says they are free but in our material they are not.

¹⁴⁹ hēt" ēr ó fil' ā.

without coarse dorsal cellular papillae on the same shoot.—On sand and among moss growing on sand.



Cephaloziella papillosa var. *heterophylla*. 1, Male inflorescence, x 66. 2, Female bracts and bracteole (b), x 66. 3, Underleaf, x 190. 4, Leaf from basal half of sterile plant, x 66. 5, Longitudinal section of leaf, convex side the ventral one, x 251. 6, Underleaf, x 190. 7, Plant with perianth, x 35. 8-9, Upper leaves of fertile shoot, x 66. 10, Median leaf cells, x 190. 11, Lobe of leaf, x 251. 12, Portion of leaf near the stem tip, x 190. 13, Part of plant, ventral view, x 43. (All original; 1-2, 7-9, 13, by Elizabeth Curtis.)

ILLUSTRATIONS: Haynes, Ann. Bryol. 11:85, several figs., 1938.

EXAMINATIONS: N.C. Isotype material (Haynes 815), and topotype material (Haynes 810) Feb. 6, 1905.

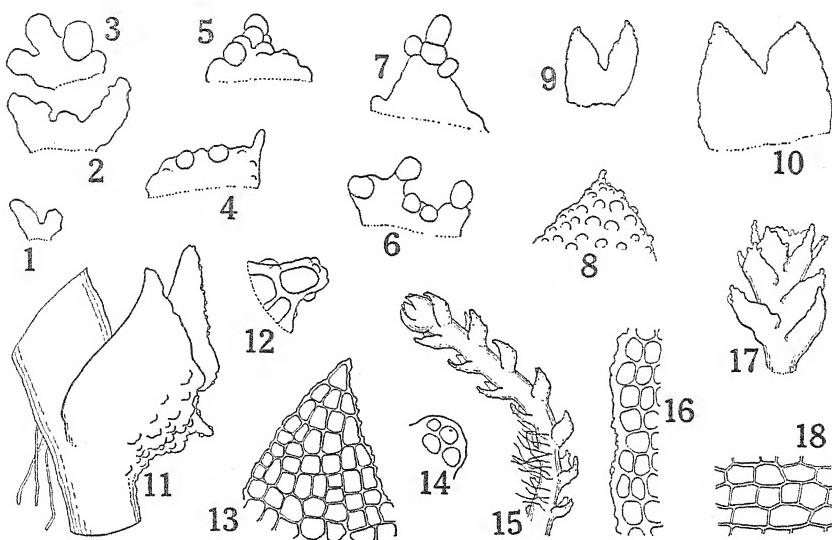
TYPE LOCALITY: Pinehurst, Moore County, North Carolina (Caroline C. Haynes 818) February 15, 1905. Pinehurst is about Lat. 35° 11' N., Long. 79° 29' W.

RANGE: N.C. (272.5). Known only from the type locality.

1b. *Cephaloziella papillosa* var. *sinuata*¹⁵⁰ n. var.

Some of the leaves on each plant papillose on the back with coarse dorsal cellular papillae; margins sinuate to crenate, rarely 1-toothed; lobes of leaves of sterile stems 10-12 cells wide at base; sinus descending about $\frac{3}{4}$ the leaf length. Cells of the leaf middle averaging about 11 μ ; walls thick; trigones indistinct; cuticle strongly papillate by more thickly walled spots. Gemmae on the upper leaves and underleaves, spherical to ovoid, 1-celled, single or in chains. Underleaves rudimentary. Plants unisexual.

¹⁵⁰ sín ú á' tā.



Cephaloziella papillosa var. *sinuata*. 1-7, Underleaves, with gemmae outlined on margin, $\times 593$. 8, Tip of leaf showing solid papillae, $\times 293$. 9, Leaf, $\times 68$. 10, Leaf, $\times 95$. 11, Piece of stem with leaf, $\times 161$. 12, Large cellular dorsal papilla, $\times 593$. 13, Lobe of leaf, $\times 293$. 14, Large cellular dorsal papilla, $\times 293$. 15, Part of plant, $\times 41$. 16, Cells along leaf margin, $\times 293$. 17, Tip of gemmiparous plant, $\times 68$. 18, Epidermal cells of stem, $\times 293$. (All original, by Elizabeth Curtis.)

Female bracts sinuate to crenate. So named from the usually sinuate leaves.—On dust settling on rock wall of cut.

ILLUSTRATIONS: None.

EXAMINATIONS: Ore. Dillard (Frye) 1934.

TYPE LOCALITY: Dillard, Oregon; on rock wall of cut (T. C. Frye) March 25, 1934.

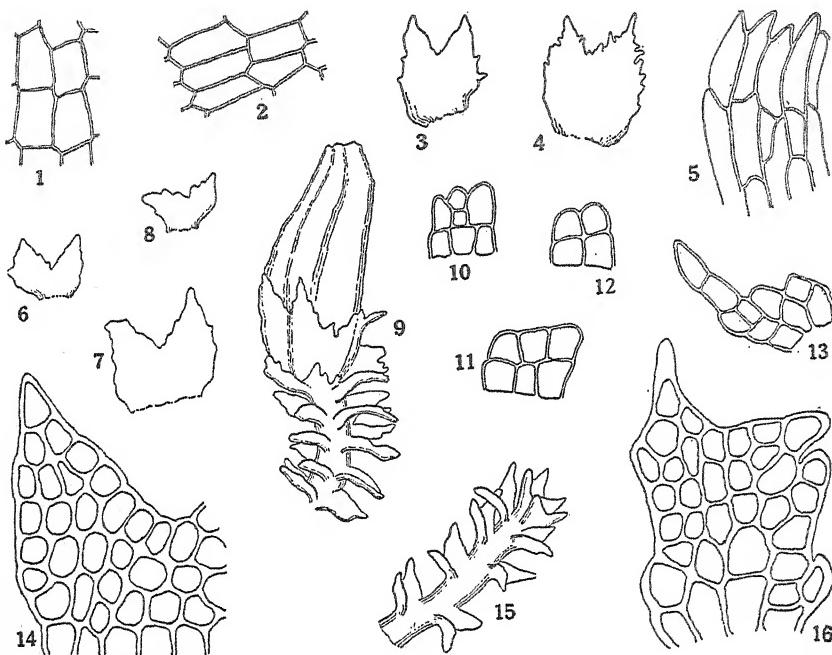
RANGE: Ore. Known only from the type collection.

Mature antheridia for comparison with those of *C. papillosa* var. *heterophylla*, not observed.

2. *Cephaloziella holzingeri*¹⁵¹ Douin, Soc. Bot. France, Mem. 29:73, 1920.

Plants in thin patches, green to brownish green; leafy shoots 175-330 μ wide. Stems 1-4 mm long, prostrate, branched, sometimes with a rejuvenation beneath the perianth; branches rather numerous, ventral in origin, often flagelliform at base; epidermal cells of the stem 15-32 μ long, 8-14 μ wide, with thin walls. Rhizoids numerous, colorless, long. Leaves alternate, transversely inserted to slightly succubous, not decurrent, distant to contiguous, spreading to erect-spreading, simply 2-lobed, roundish to cuneate,

¹⁵¹ höl' zing' ēr i.



Cephalozia holzingeri. 1-2, Epidermal cells of stem, surface view, x 352. 3, Female bracteole, x 80. 4, Female bract, x 80. 5, Part of mouth of perianth, x 352. 6-8, Leaves, x 80. 9, Tip of shoot with perianth, x 46. 10-13, Underleaves, x 352. 14, Half a large leaf of sterile stem, x 352. 15, Part of sterile shoot, x 60. 16, Small leaf, x 352. (All original. 3-4, 6-8, 9, 15, by Elizabeth Curtis.)

90-130 μ long, 100-150 μ wide, with occasional dorsal papillae, the papillae merely partly projecting cells with the wall thicker at the tip; margin entire to toothed, often with one large tooth about the middle on one or both sides; lobes triangular, 3-5 cells wide; sinus descending $\frac{1}{2}$ - $\frac{3}{5}$ the leaf length, obtuse to crescentic. Cells of the leaf middle 8-20 μ , of the apex and base not greatly different; walls distinctly thickened, the cell hollow rounded; trigones moderately large, not bulging into the cell hollow; cuticle smooth to verruculose. Gemmae unknown. Underleaves present throughout or nearly so, abortive on flagella-like bases of branches, mostly a single row of cells from a broader base, 2-lobed just below the female bracteole. Plants probably unisexual. Male inflorescence unknown. Female inflorescence terminal on ordinary unmodified shoots; female bracts from little larger to twice as large as the normal leaves below the inflorescence, broadly ovate, 2-lobed for $\frac{1}{4}$ - $\frac{1}{2}$ the length, the margins coarsely toothed, the teeth larger than those of the leaves; the lobes triangular, acute to acuminate, ending in a long hyaline cell; the sinus

acute to obtuse; bracteole slightly united at base with the bracts, about $\frac{2}{3}$ - $\frac{3}{4}$ the length and width of the bracts, ovate, 2-lobed, the margin with a few coarse teeth, the lobes acute, the sinus acute to obtuse. Perianth ovate to cylindrical, 365-730 μ long, 220-650 μ wide, bluntly plicate in the upper half or more, hyaline in the upper $\frac{1}{4}$ - $\frac{1}{3}$, the basal epidermal cells isodiametric, the upper cells 3-6 times long as wide, 2 cells thick at base, 1 cell thick in the upper $\frac{3}{4}$, very gradually and little narrowed to the mouth; mouth $\frac{1}{2}$ - $\frac{3}{4}$ as wide as the perianth, slightly lobed, the lobes crenulate with projecting cells. Mature sporophyte unknown. Named in honor of John M. Holzinger, an active collector and botanist of Winona, Minnesota.—On soil.

ILLUSTRATIONS: None.

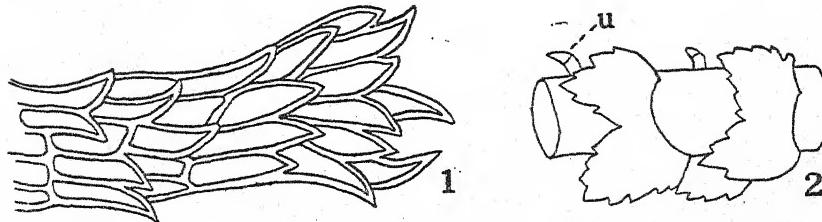
EXAMINATIONS: D.C. District of Columbia and vicinity (J. M. Holzinger) 1890-1903.

TYPE LOCALITY: "Am. du N." Probably the species was named from material from the District of Columbia.

RANGE: D.C. (117.2). We know of no other report of this than Douin's original one.

3. *Cephaloziella scabrifolia*¹⁵² Douin & Schiffn., Soc. Bot. France, Mem. 29:66, 1920.

Leaves alternate, transversely inserted or slightly succubous, not decurrent, distant, erect-spreading, simply 2-lobed, quadrate, often wider than long, 1½ times the width of the stem, usually papillose with projecting cells on the back; margin with numerous teeth; lobes dentate, 4-7 cells wide, often decolorate at tip, acute to obtuse; sinus descending about $\frac{1}{2}$ the leaf length, acute to obtuse. Cells of the leaf large, 13-18 μ , usually with papillae due to thickened spots on the wall. Underleaves present on sterile non-gemmiparous plants, wide, short. Plants "apparently paroicous," perhaps wrongly so. Perianth with cells projecting from inside in the form of sharp teeth. The name from *L. scabrosus*, rough, and *folium*, leaf; in reference to the rough dorsal surface of the leaf, due to teeth.



Cephaloziella scabrifolia. 1, Part of mouth of perianth, x 297. 2, Part of plant, lateral view, showing underleaves (u), x 55. (After Douin.)

¹⁵² skā bri fō' li ā.

ILLUSTRATIONS: Douin, Soc. Bot. France, Mem. 29: pl. 7, fig. 59 and pl. 8, fig. 80, 1920.

EXAMINATIONS: None.

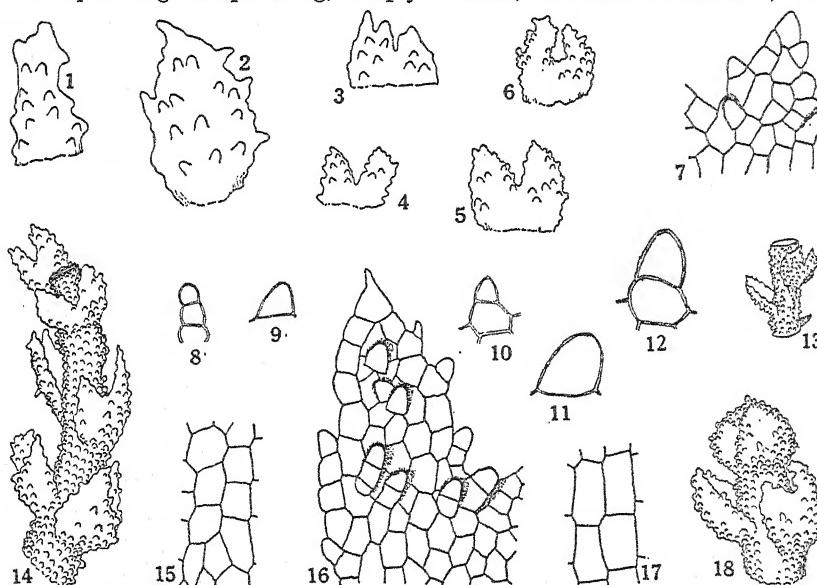
TYPE LOCALITY: Atsion, New Jersey, about Lat. $39^{\circ} 44' N.$, Long. $74^{\circ} 43' W.$

RANGE: N.J. (117.2). Known only from the type locality.

Douin does not describe the plant. He merely gives a key to the species of *Cephaloziella*, thus bringing out certain characters. He places it in the *C. starkii* (here *C. byssacea*) group, with plants unisexual. It remains a questionable species, until someone adequately describes and figures it. We examined some material of *Cephaloziella* by Evans from Atsion, but did not find this plant. The characters here given are from Douin's (117.2) meager account. The tooth-like cells projecting out of the mouth of the perianth may distinguish it.

4. *Cephaloziella spinicaulis*¹⁵⁸ Douin, Revue Bryol. 40:81, 1918.

Plants in thin patches, light green. Stems 1-4 mm long, ascending, branched, densely papillose with projecting cells; papillae up to 1 cell long; branches numerous, ventral in origin; epidermal cells 10-24 μ long, 8-16 μ wide, with thin walls. Rhizoids few, colorless, short. Leaves alternate, transversely to slightly succubously inserted, not decurrent, distant, erect-spreading to spreading, simply 2-lobed, roundish to obovate, 120-



Cephaloziella spinicaulis. 1-3, Underleaves, x 193. 4-6, Leaves, x 80. 7, Half a small leaf, x 352. 8, Large papilla from stem, x 352. 9-10, Papillae of leaves, x 352. 11-12, Papillae of leaves, x 712. 13, Part of stem, x 22. 14, Part of stem, x 80. 15, Epidermal cells of immature stem, x 352. 16, Half a leaf, dorsal view, x 352. 17, Epidermal cells of mature stem, x 352. 18, Tip of plant, x 80. (13, after Douin. All others original; 1-6, 14, 18, by Elizabeth Curtis.)

¹⁵⁸ spin i kāl' is.

160 μ long, 100-155 μ wide, not wider than the stem, strongly papillose on the back; the papillae 3 cells or less long, mostly 1 cell long, their walls like those of the leaf cells; margin coarsely dentate; lobes triangular to ovate, 4-7 cells wide at base, commonly acute but sometimes obtuse or rounded on account of irregular teeth; sinus descending $\frac{1}{2}$ - $\frac{3}{5}$ the leaf length, acute to obtuse or roundish. Cells of the leaves 9-16 μ , averaging 11-14 μ ; walls thin; trigones wanting; cuticle smooth. Gemmae unknown. Underleaves common, not lobed to 2-3-lobed, longer than wide to wider than long; those of the larger stems irregularly lanceolate to very widely ovate, 50-135 μ long, 50-90 μ wide, the width not proportional to the length, coarsely and abundantly papillose on the back like the leaves. Reproduction and sporophyte unknown. The name from L. *spina*, a spine, and *caulis*, a stem; in reference to the densely papillose stem, called spinose by Douin.—On rock.

ILLUSTRATIONS: Douin, Soc. Bot. France, Mem. 29: pl. 8, fig. 82, 1920.

EXAMINATIONS: Conn. Mt. Carmel near Hamden (Evans) 1908; Cathedral Rock at West Hartford (Annie Lorenz) 1914.

TYPE LOCALITY: "Conn." Douin does not give the locality. The earliest material seems to be from Mt. Carmel, near Hamden, Connecticut (A. W. Evans) April, 1908.

RANGE: Conn. (117.2), southern Appalachian Mountains (64.5).

The "spines" of the stem, which are the basis of the specific name, and those of the leaf and underleaf as well, are large papillae rather than spines. They are not sharply pointed, and the wall at the tip is not thickened more than the walls of the ordinary cells of the leaves. One gets the impression of a very thick wall at the tip of a papilla at first glance, but the appearance is due to the shrinking of cell contents away from the wall. The papilosity of the stem makes it the most easily recognized species of the genus.

BYSSACAE¹⁵⁴

Backs of the leaves without papillae composed of projecting cells; plants unisexual.

In place of a key, compare numbers 5-10 on folding chart following page 508.

5. *Cephaloziella byssacea*¹⁵⁵ (Roth) Warnst. Krypt.-Fl. Mark Brandenburg 1:224, 1902.

Jungermannia byssacea Roth, Tent. Fl. Germ. 3:307, 1800.

Jungermannia divaricata Sm. in Sowerby Engl. Bot. pl. 719, 1800.

Jungermannia confervoidea Raddi, Mem. Soc. Ital. Sci. Modena 18:18, 1818.

*Jungermannia starkii*¹⁵⁶ Nees Naturg. Eur. Leberm. 2:223, 1836.

Cephalozia divaricata var. *incurva* Lindb., Oefv. Kgl. Vet.-Akad. Foerh. 23:560, 1867.

Cephalozia starkii Cogn., Bull. Soc. Bot. Belgique 10:285, 1872.

¹⁵⁴ býs sá' sé. Purposely contracted from byssaceae to avoid the confusion of a family ending.

¹⁵⁵ býs sá' sá' á.

¹⁵⁶ According to K. Mueller (409) 2:176 the species name *starkii* was in honor of Rev. Starke. Probably it is for that reason K. Mueller gives all his citations as *starkei* although most authors used "ii."

Cephalozia divaricata var. *starkii* Spruce, On Cephalozia 64, 1882.

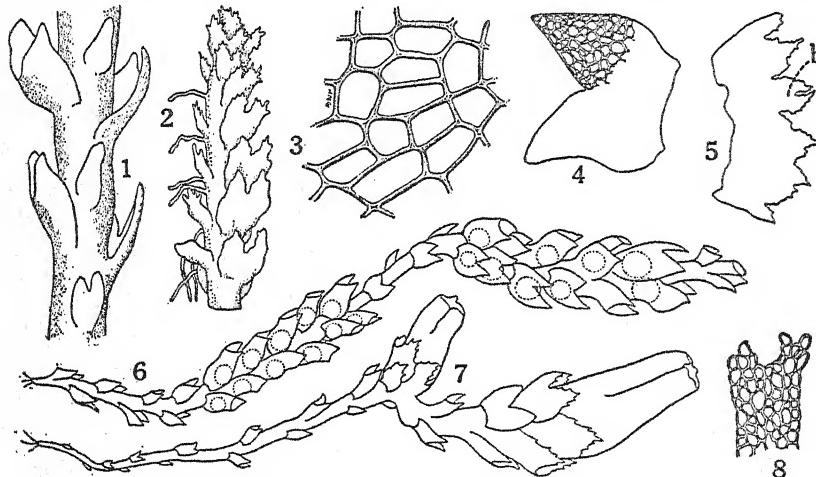
Cephalozia rubriflora C. Jens. Revue Bryol. 20:68, 1893, in part according to Douin.

C. divaricata Schiffn., Engler & Prantl Pfl.-Fam. 3(1):99, 1895.

Cephalozia byssacea Heeg., Verh. K. K. Zool.-Bot. Gesell. Wien 43:96, 1893.

C. starkii Schiffn., Lotos 48:341, 1900.

Plants in patches, dark green to purple or sometimes blackish; leafy shoots about 0.2-1 mm wide. Stems 3-10 mm long, prostrate to ascending, simple or sparingly branched, rigid, brittle, sometimes innovating beneath the female inflorescence, about 70 μ thick, circular in cross section; epidermal cells of the stem quadratic, the walls little thickened. Rhizoids on sterile stems rather few, beneath the female inflorescence often numerous and long, colorless. Leaves alternate, transversely inserted, not decurrent, simply 2-lobed, in general outline quadrate to ovate or obovate to cuneate; not coarsely papillate on the back; those of sterile stems distant, small, usually widely spreading and flat or sometimes concave; those of fertile shoots subimbricate to imbricate and gradually larger



Cephalozia byssacea. 1, Part of stem, ventral view, x 106. 2, Tip of a stem, side view, with formation of gemmae at tips of leaves, x 53. 3, Leaf cells, x 557. 4, Leaf, x 53. 5, Involucr, spread out, also bracteole (b), x 53. 6, Part of male plant with two inflorescences, x 16. 7, Part of female plant with 2 inflorescences, x 16. 8, Gemmiparous leaf, x 122. (3, original, by Helen Gilkey; 6-7, after Douin; the others after K. Mueller.)

toward stem tip, slightly concave to nearly semicylindric, the apex often incurved; margins entire; lobes equal, ovate-lanceolate, acute or subacute, straight or somewhat divergent, 6-10 cells wide at base, entire; sinus descending $\frac{1}{2}$ - $\frac{2}{3}$ the leaf length, acute to obtuse. Cells of the leaf middle 7-12 μ , of the lobes and margin as well as the base about the same, quadrate to polygonal; walls thin or only slightly thickened; trigones wanting

or minute; cuticle smooth or rarely papillose. Gemmae in clusters, on young leaves and underleaves at the apex of the sterile stems, ovoid, 2-celled, with a wart-like projection at each end, yellowish green to reddish. Underleaves present throughout, subulate-lanceolate or sometimes 2-lobed, their tips incurved. Plants unisexual. Male plants mostly in separate patches; male inflorescence terminal or on ventral branches; male bracts larger than the stem leaves, 8-24, closely imbricate, 2-lobed to about $\frac{1}{2}$ their length, rounded-quadrangular, concave, entire; antheridium 1. Female inflorescence terminal; female bracts suddenly much larger than the leaves, 2-lobed for $\frac{1}{4}$ - $\frac{1}{3}$ their length; the lobes acuminate, sharply dentate to subspinulose, the margin and apex hyaline, the cell walls quite thick; bracteole rather smaller than the bracts, united for about $\frac{1}{2}$ its length with one or both of them. Perianth fusiform, about $\frac{1}{2}$ -emergent, 3-6-plicate, greenish to purplish below, hyaline above, rather gradually contracted to the mouth; mouth crenulate. Sporangium ovoid, very small, reddish brown. Elaters 6-8 μ thick; spirals 2, reddish brown. Spores 6-9 μ , almost smooth, purplish brown. Name from *L. byssus*, a fine yellowish flax; but we are uncertain whether this is in reference to the numerous long rhizoids beneath the female inflorescence, or to the leafy shoots.—On dirt banks, on rocks, on rotten wood, on sand; subalpine to sea level.

ILLUSTRATIONS: Pearson (433) 2: pl. 67; K. Mueller (409) 2: fig. 51; Jensen (323.5) 215, figs. 1-9; Macvicar (374) 282, figs. 1-6; Meylan (386) fig. 159; Warnstorff (523) 222, fig. 8; Gil (76) figs. 270 and 271 e-f; Radzi, Mem. Soc. Ital. Sci. Modena 18: pl. 4, fig. 1, 1818; Douin, Revue Gen. Bot. 28: pl. 11, figs. 1-12; pl. 12, figs. 14-15, 19-24; pl. 16, figs. 65-71, 1916; also Douin, Soc. Bot. France, Mem. 29: pl. 2, figs. 53-54; pl. 6, figs. 48-49, 57, 1920.

EXAMINATIONS: *Ida*. Atlanta Hot Springs in Elmore County (MacFadden) 1941.—*Pa.* Everett (Lanfear 113-f) 1930.—*Wash.* Gate (Foster) 1902.—*Wyo.* Yellowstone National Park (Kiener 5968) 1936.

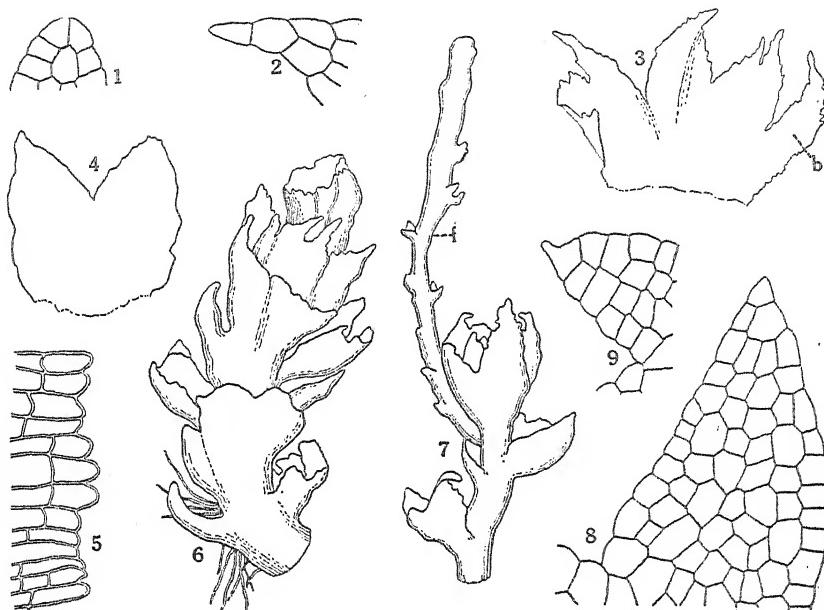
TYPE LOCALITY: European.

RANGE: Greenland (248), Labrador (373), Arctic America (283), Alaska (239.1), B.C. (431), Wash. (81), Ore. (263), Calif. (202), Wyo. (446), Alta. (373), Minn. (212), Wis. (98), Ill. (246.5), Ont. (431), Que. (178), N.Y. (63), Pa. (338), W.Va. (3.2), N.C. (43), Md. (212), N.J. (506), Conn. (212), Mass. (169), Vt. (171), N.H. (203), Me. (430), N.S. (53.2); Australia (as New Holland) (226); Asia (433); Africa (101.1); Falkland Isls. (226); Azores (2.075); Eur. (409); Spitzbergen (524.3); Jan Mayen Isl. (248.1).

6. *Cephaloziella lorenziana*¹⁵⁷ Douin, Soc. Bot. France, Mem. 29:70, 1920.

Plants occurring singly among moss, green to brownish green; leafy shoots 365-660 μ wide. Stems 3-5 mm long, about 100 μ thick, much branched, rejuvenating below the female inflorescence; branches ventral in origin; epidermal cells averaging about 24 μ long and 11 μ wide. Rhizoids few, colorless, rather short. Leaves alternate, slightly succubous to

¹⁵⁷ lôr ēn zî' nă.



Cephaloziella lorenziana. 1-2, Extremes in form of leaf tips, $\times 352$. 3, Female bracts and bracteole (*b*), $\times 60$. 4, Leaf, $\times 60$. 5, Part of mouth of perianth, $\times 267$. 6, Tip of plant with perianth, $\times 60$. 7, Shoot with flagellum (*f*), $\times 60$. 8, Lobe of large leaf, $\times 267$. 9, Lobe of small leaf, $\times 352$. (All original; 3-7, by Elizabeth Curtis.)

transversely inserted, not decurrent, distant, spreading to erect-spreading, simply 2-lobed, circular, or obovate on account of the spreading of the lobes, without dorsal papillae or spines, $25-60 \mu$ long and wide; margins entire to sinuate; lobes equal or the ventral the larger, 4-9 cells wide, short, acute, commonly ending in a row of 1-2 cells of which the terminal one is 1-3 times as long as wide, but occasionally the row 3 cells long or the tip 2 cells wide; sinus $\frac{2}{5}-\frac{3}{5}$ the leaf length, obtuse to rounded. Cells of the leaves $9-17 \mu$, about the same throughout the leaf; walls somewhat thickened; trigones wanting or minute; cuticle smooth. Gemmae unknown. Underleaves present throughout, quite distinct but usually small.¹⁵⁸ Plants probably unisexual but male inflorescence not seen. Female inflorescence terminal on an ordinary unmodified shoot; female bracts unequally 2-lobed but sometimes the lobes again lobed; the lobes varying in form but ovate to lanceolate, sinuate to somewhat toothed, mostly acute; the sinus $\frac{1}{3}-\frac{1}{2}$ the length of the bract, acute; bracteole unlobed, sinuate to somewhat toothed, ovate, acute, united for about half its length with both bracts.

¹⁵⁸ In the few plants available to us we were not able to identify the underleaves with certainty.

Perianth ovoid, bluntly plicate, about 365 μ long and 290 μ in diameter, 2 cells thick in about the lower half, 1 cell thick above, the cells below about as long as wide, those near mouth 2-4 times as long as wide, usually gradually narrowed to the mouth; mouth about half as wide to as wide as the perianth, very shallowly lobed, crenate by projecting cells, hyaline. Mature sporophyte not seen. Named in honor of its discoverer, Annie Lorenz, a New England collector and botanist.—On damp moss on face of a rock ledge.

ILLUSTRATIONS: None.

EXAMINATIONS: Conn. West Hartford (Annie Lorenz 867) 1911.

TYPE LOCALITY: West Hartford, Connecticut (Annie Lorenz) Jan. 24, 1911.

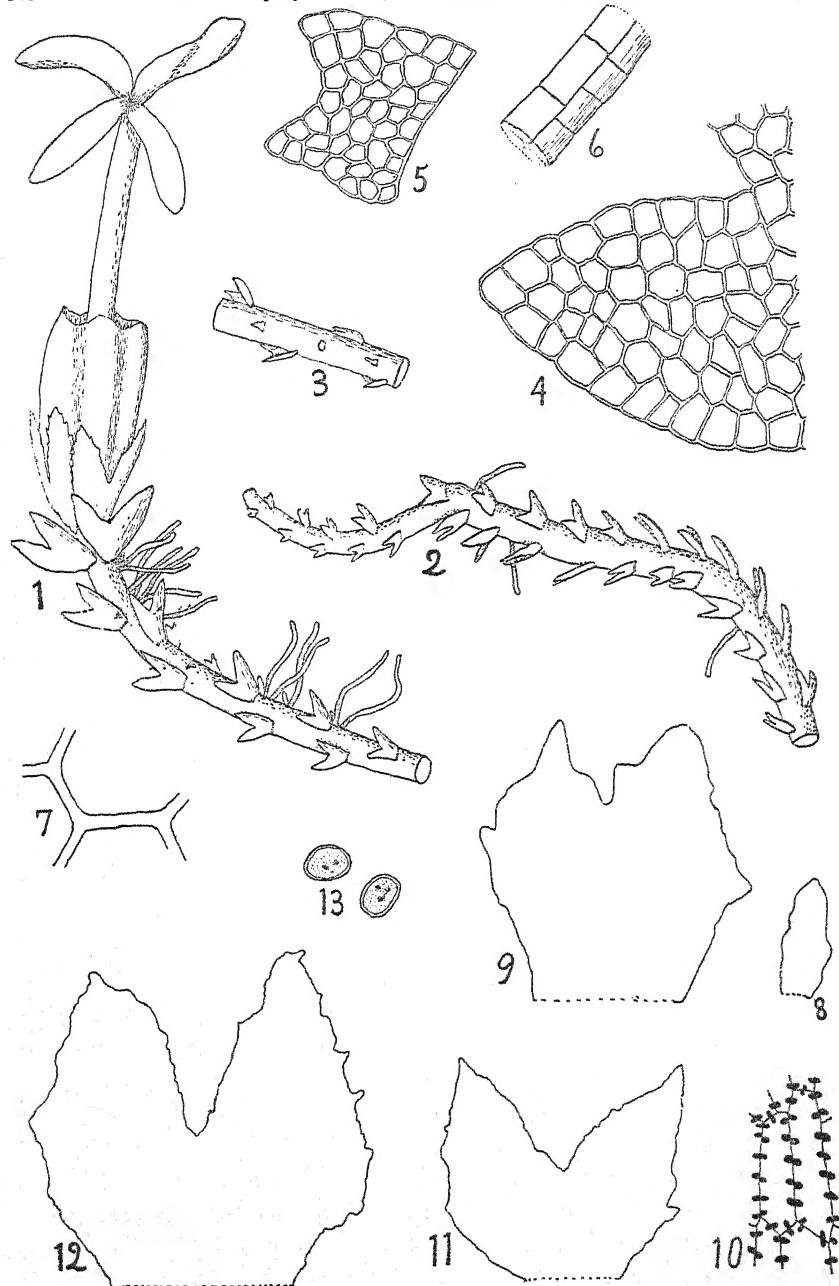
RANGE: We know of no report except the original collection.

7. *Cephaloziella alpina*¹⁵⁹ Douin, Revue Gen. Bot. 28:269, 1916.

C. grimsulana K. Muell. in Rabenh. Krypt.-Fl. 6(2):121, 1913, according to Joergensen (325). Not of Douin, Soc. Bot. France, Mem. 29:79, 1920.
C. alpina var. *groenlandica* Douin, Soc. Bot. France, Mem. 29:71, 1920.

Plants in thin patches, minute, green; leafy shoots 200-500 μ wide. Stems 0.5-10 mm long, prostrate with ascending tips, simple or sparingly branched; branches ventral in origin. Rhizoids numerous, colorless to brownish, long, present nearly to tip of stem. Leaves alternate, transversely to slightly succubously inserted, not decurrent, distant or toward tip imbricate, erect-spreading, without teeth or large papillae dorsally, simply 2-lobed, more or less quadrate, 90-190 μ long, 140-160 μ wide; margin entire except for turgidity of cells, occasional leaves just below the female bracts with a few irregular teeth near the apex; lobes 4-12 cells wide but usually on sterile stems 4-8, acute to rounded; sinus descending $\frac{1}{2}$ - $\frac{2}{3}$ the leaf length, acute to almost right-angular. Cells of the leaves 10-14 μ wide but sometimes up to 22 μ long; walls equally somewhat thickened; trigones none or minute; cuticle minutely verruculose. Gemmae of 2 equal cells, ellipsoid, smooth. Underleaves present on sterile stems as well as in the female inflorescence, not always present throughout on the sterile stems, small to half as long as the leaves, unlobed or very rarely 2-lobed, subulate to lanceolate, usually 50-70 μ long and 20-40 μ wide. Plants unisexual. Male plants unknown. Female bracts 2-4 times as long as the leaves of normal sterile shoots, 2-lobed for $\frac{1}{3}$ - $\frac{1}{2}$, about 200 μ long and 240 μ wide, with small irregular marginal teeth; bracteole similar to the bracts, united with them for $\frac{1}{2}$ - $\frac{2}{3}$ its length. Perianth ellipsoid-cylindric, 490-680 μ long, $\frac{1}{2}$ - $\frac{2}{3}$ -emergent, 4-plicate in the upper part, green to hyaline below, more or less hyaline toward the mouth, of cells 4-12 μ wide, roundly to hardly narrowed at mouth;

¹⁵⁹ *äl pi' nä*. We have found no record of the name earlier than 1916, but consider it is likely of earlier date, from the scant remarks in this citation.



CephalosIELLA alpina. 1, Plant, semidiagrammatic, $\times 40$. 2, Flagellum, dorsal view, $\times 155$. 3, Part of flagellum, ventral view, $\times 155$. 4, Part of leaf, $\times 670$. 5, Leaf from flagellum, $\times 670$. 6, Part of stalk of sporangium, semidiagrammatic, $\times 100$. 7, Cell angles, $\times 1400$. 8, Underleaf from sterile branch, $\times 155$. 9, Underleaf from near tip of fertile branch, $\times 155$. 10, Thickening in wall of sporangium, inner view, $\times 670$. 11, Leaf just below bract, $\times 155$. 12, Bract, $\times 155$. 13, Spores, $\times 670$. (All after Clark and Frye.)

mouth $\frac{1}{3}$ - $\frac{7}{8}$ the width of the perianth, shortly lobed, crenulate with long cells. Seta about 1-5 mm long, of 4 cells in cross section. Sporangium ellipsoid, about 200 μ long, brown, the valves separating to base, wall 2 cells thick; inner wall layer with semiannular thickenings. Elaters 50-100 μ long, about 10 μ thick; spirals 2, brown. Spores 10-14 μ , smooth, brown. So named on account of the alpine habitat.—On rotten wood; alpine and arctic.

ILLUSTRATIONS: Clark and Frye (81) 110, figs. 1-13.

EXAMINATIONS: *Ida*. Lake Atwater in Latah County (F. G. Meyer) 1939; Moscow Mt. in Latah County (Lois Clark) 1923.

TYPE LOCALITY: European.

RANGE: *Ida*. (81); Eur. (218.6).

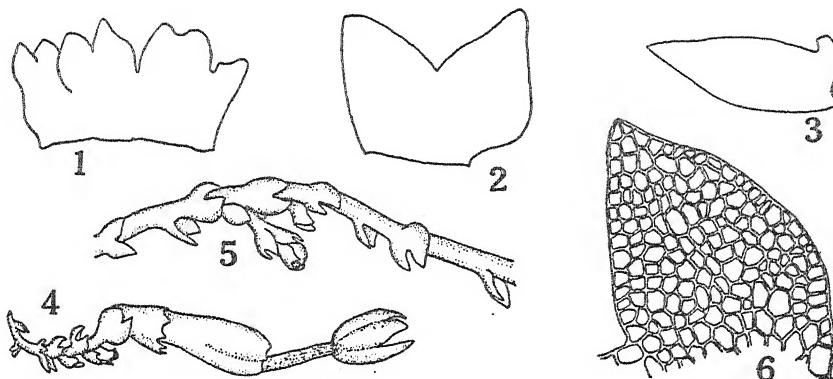
Probably we have the plant described by K. Mueller as *C. grimsulana*. Ours seems to have a shorter perianth for its width, and to have much narrower cells composing the perianth. Otherwise there are only insignificant differences. Our observations agree with those of K. Mueller also in that the plant is unisexual, but neither K. Mueller nor we have found the male inflorescence. In our description in Publ. Puget Sound Biol. Station 6:109, 1928, we called it "monoicous," believing we merely had not found the male inflorescence in our limited material. We have now more material, and yet have seen no male inflorescence. Our observation therefore leads us to say that it is unisexual in so far as we have observed. This agrees with *C. grimsulana* of K. Mueller. But Douin (117.2 and 117.25) keys both *C. alpina* and *C. grimsulana* under "autoicous." C. Jensen (323.5) also calls *C. alpina* "autoicous." In fact it seems to us that the chief distinction between the two species lies in the unisexual *C. alpina* and the bisexual *C. grimsulana*. In the European turmoil at this time of writing, efforts to secure authentic material for comparison seem useless.

8. *Cephaloziella biloba*¹⁶⁰ (Spruce) K. Muell., Rabenh. Krypt.-Fl. 6(2):174, 1913.

Cephalozia (subgenus *Cephaloziella*) *biloba* Lindb. in Spruce, On Cephalozia 66, 1882.

Plants in patches, green to dark colored. Stems up to 1 cm long, composed of thin-walled cells; branches few, lateral. Rhizoids few. Leaves alternate, transversely inserted, not decurrent, distant, erect-spreading to spreading, simply 2-lobed, broadly quadrate, smooth on the back, wider than the stem; margin entire or sometimes with a small narrow tooth at the base of the dorsal margin; lobes broadly lanceolate, acute or sometimes obtuse, 7-12 cells wide at base; sinus descending $\frac{1}{2}$ - $\frac{3}{4}$ the leaf length, acute to obtuse. Cells 12-20 μ , polygonal, 1-1½ times as long as wide; walls uniformly somewhat thickened; trigones wanting. Gemmae at tips of upper leaves, ovoid, 1-2-celled. Underleaves wanting, or present only near stem tip, very small, often 2-lobed. Plants unisexual; both inflorescences terminal on an unmodified shoot. Male bracts saccate, the margin entire; antheridia 1-2. Female bracts larger than the leaves, 2-3-lobed, the lobes blunt and often irregular, the sinuses descending $\frac{1}{5}$ - $\frac{1}{3}$

¹⁶⁰ bi 15' bā.



Cephaloziella biloba. 1, Involucrè, spread out, $\times 27$. 2, Leaf, $\times 53$. 3, Underleaf, $\times 144$. 4, Part of a female plant bearing a sporophyte, $\times 13.3$. 5, Part of sterile plant, $\times 18.6$. 6, Lobe of leaf, $\times 148$. (All after K. Mueller.)

the bract length; bracteole 2-lobed for about $\frac{1}{3}$, united with both bracts for $\frac{1}{2}$ - $\frac{2}{3}$ its length and with them making a rather closely fitting cup about the base of the perianth. Perianth clavate, slightly plicate in the upper $\frac{1}{3}$, contracted rather roundedly to the mouth; cells of the perianth quadrate, about 10μ , smooth; mouth crenulate. Sporangium ovoid-oblong. Elaters about 8μ wide, spirals 2, reddish brown. Spores about 10μ , smooth, reddish brown. The name the *L. bilobus*, 2-lobed; in reference to the bilobed leaves.¹⁶¹—On soil, on dirt in rock crevices, among mosses.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 50.

EXAMINATIONS: *Greenland*. Crimson Cliffs, in the northwestern part (S. W. Bartlett 40) July 21, 1940.

TYPE LOCALITY: Near Helsinki, Finland (Lindberg) 1875.

RANGE: Greenland, Ellesmere Isl. (56.01); Spitzbergen (409); Eur. (409).

We consider *C. starkei* var. *examphigastriata* K. Muell., Rabenh. Krypt-Fl. 6(2):180, 1913 as falling under *C. biloba*. There are no known characters by which to separate them. However, lacking the material for examination we leave the matter to others.

9. *Cephaloziella patulifolia*¹⁶² (Steph.) Douin, Soc. Bot. France, Mem. 29:70, 1920.

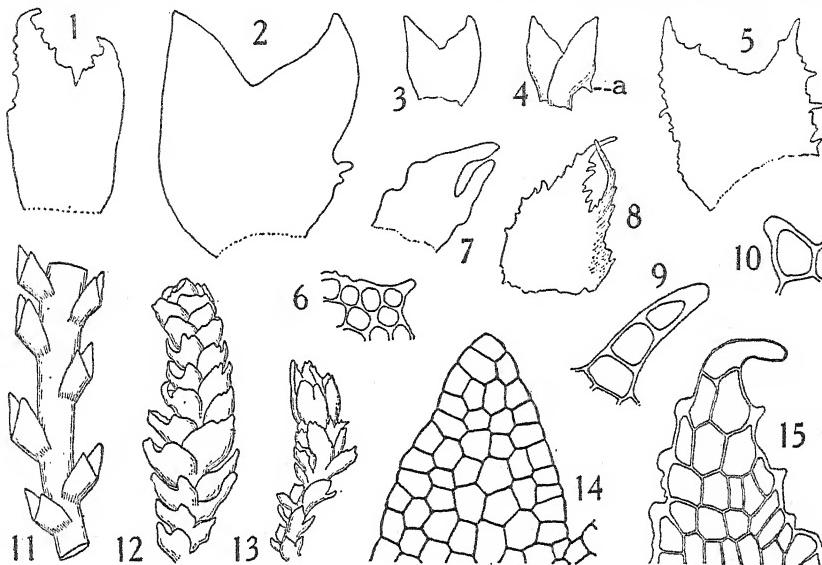
Cephalozia patulifolia Steph., Bull. Herb. Boissier, Ser. 2, 8:509, 1908; also Sp. Hep. 3:359, 1908.

Plants in dense mats, brownish green. Stems up to 5 mm long, rigid, quite thick for the length, fuscous, with few lateral branches. Rhizoids few. Leaves alternate, transversely to slightly succubously inserted, not decurrent, distant to approximate on sterile stems, imbricate near the

¹⁶¹ The name is not a distinctive one since all the species of *Cephaloziella* are bilobed. Discriminative names are desirable.

¹⁶² păt' ū li fō' li ā.

inflorescences, spreading, squarrose, simply 2-lobed, roundish concave and the keel armed dorsally with large papillae; these papillae 1-3 cells long, thick-walled at tip, curved when long; margin entire, or in leaves near the perianth with conical cellular projections; lobes oblong to lanceolate, 6-8 cells wide, acuminate, widely spreading, horizontal, often



Cephaloziella patulifolia. 1, Female bracteole, x 95. 2, Leaf shortly below perianth, x 95. 3, Leaf, x 41. 4, Leaf with cellular dorsal papilla (*a*), x 68. 5, Female bract, x 95. 6, Cells of leaf margin, x 293. 7, Underleaf, x 222. 8, Female bracteole, x 95. 9-10, Cellular dorsal papillae of the leaves, x 593. 11, Piece of sterile shoot, dorsal view, x 68. 12, Male inflorescence, x 41. 13, Tip of plant with perianth, x 21. 14, Leaf lobe, x 293. 15, Tip of female bracteole, x 293. (All original; 1-2, 9-11, 14-15, by Elizabeth Curtis.)

unequal with the larger dorsal; sinus descending $\frac{2}{5}$ - $\frac{2}{3}$ the leaf length, acute or mostly obtuse. Cells of the upper part of the leaf about 13μ , of the base about 18 by 27μ ; walls thickened, along the margin quite so; trigones small; cuticle dorsally densely gibbose-incrassate. Gemmae unknown. Underleaves few, spreading, curved, narrow, 2-lobed or subulate. Plants unisexual. Male inflorescence terminal; male bracts larger than the sterile leaves, more unequally 2-lobed, the dorsal lobe of some bracts again shallowly notched. Female bracts larger than the leaves of sterile stems, widely ovate-triangular, 2-lobed for about $\frac{1}{2}$, concave, the margin all around with many obtuse teeth; the lobes unequal, horizontal, acute; bracteole ovate-rectangular, 2-3-lobed for $\frac{1}{3}$ its length, the margin free from the bracts, with long cilia all around. Perianth (young) 3-plicate, cells of its upper portion 9 by 36μ , quite thick walled, those near the base

with thinner walls; mouth truncate, crenulate by long finger-like projecting cells. Sporophyte unknown. The name the L. *patulus*, expanded or spread, and *folium*, leaf; in reference to the spreading leaves.—On soil.

ILLUSTRATIONS: None.

EXAMINATIONS: Cal. Collected by Bolander.

TYPE LOCALITY: "California" (Henry Bolander).

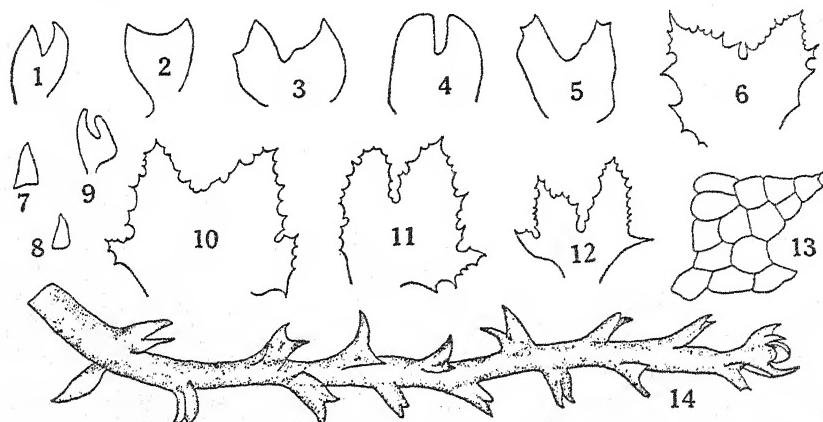
RANGE: Cal. (521).

Stephani remarks that *Cephalozia divaricata* var. *scabra* Howe may belong here, but it is now referred to *Cephaloziella papillosa*.

10. *Cephaloziella minima*¹⁶² (Pears.) Douin, Soc. Bot. France, Mem. 29:64, 1920.

Cephalozia minima Aust., Pears. List Canadian Hep. 11, pl. 7, in Geol. & Nat. Hist. Surv. of Canada, 1890.

Plants minute, with head-like tip, green. Stems 1-2 mm long, about 300 μ thick, about 5 cells thick, unbranched, without flagella; epidermal cells in 10-15 rows. Leaves alternate, transversely to slightly succubously inserted, not decurrent, distant or near perianth imbricate, erect-spreading, simply 2-lobed, obovate or broadly ovate to subquadrate, roundedly concave, of the sterile stems about 150 μ long and 100 μ wide, smooth on the back, those near tip larger and crowded especially on fertile stems, thus giving the plants a capitate appearance; margin entire on sterile stems, sharply dentate on bract-like leaves near perianth; lobes equal, or unequal with the ventral the larger, acute, 50-100 μ or 3-9 cells wide; sinus descend-



Cephaloziella minima. 1-5, Leaves, x 90. 6, Bract-like leaf just below female bract, x 90. 7-8, Underleaves, x about 106. 9, Underleaf just below the female bracteole, x 90. 10-11, Female bracts, x 90. 12, Female bracteole, x 90. 13, Portion of a leaf, x 307. 14, Sterile stem, dorsal view, x 90. (All after Pearson.)

¹⁶² min' i mä.

ing $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, acute to rounded or crescentic. Cells of the leaves 12-16 μ ; walls somewhat equally thickened; trigones wanting; cuticle smooth. Gemmae unknown. Underleaves present throughout, the lower ones entire, broadly subulate; the upper larger, 2-lobed, with broadly subulate lobes. Plants unisexual. Male stems more slender; male inflorescence on short ventral branch; male bracts 3-4; antheridium 1, very small, roundish. Female inflorescence terminal on main shoot; female bracts much larger than the leaves of sterile shoots, about 250 μ long and 300 μ wide, $\frac{1}{3}$ - $\frac{1}{2}$ -bilobed and with a smaller lobe on one or both sides, spinulose-dentate; bracteole somewhat smaller than the bracts, otherwise very similar, free from the bracts. Perianth oblong-oval, 1 cell thick; mouth rather wide, subentire. Other parts unknown. The name from the *L. minimus*, the smallest; in reference to the small size of the plant as a whole.—On rotten wood and old logs, in swamps.

ILLUSTRATIONS: Pearson (431) 2: pl. 6.¹⁶⁴

EXAMINATIONS: None.

TYPE LOCALITY: Belleville, Ontario (John Macoun) May, 1868. About Lat. 44° 10' N., Long. 77° 20' W.

RANGE: Ont. (431). Known only from the type collection.

STELLULIFERAE¹⁶⁵

Backs of the leaves without papillae composed of projecting cells; plants bisexual; male bracts on the same shoot as the female bracts.

In place of a key, compare numbers 11-18 on folding chart following page 508.

11. *Cephaloziella stellulifera*¹⁶⁶ (Tayl.) Schiffn. Bryologische Fragmente 23, in Oesterr. Bot. Zeitschr. 55: in 1905.

Jungermannia stellulifera Tayl., in G. L. & N. Syn. Hep. 134, 1844.

Cephalozia heteroica Cooke, Trans. Conn. Acad. Sci. 12:38, 1904.

Cephalozia patula Steph., by Levier in Bull. Soc. Bot. Ital. 28:210, 1905.

Cephalozia hypogyna Steph., Bull. Herb. Boissier, Ser. 2, 8:499, 1908; also Sp. Hep. 3:329, 1908.

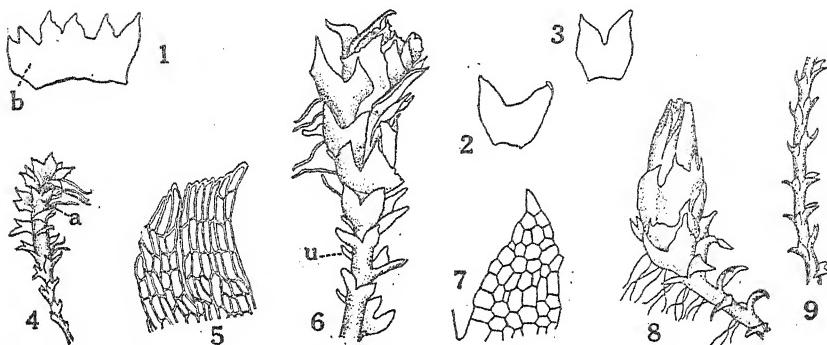
C. limprichtii var. *stellulifera* K. Muell., Rabenh. Krypt.-Fl. 6(2):142, 1912.

Plants in patches, pale yellowish green. Stems 5-9 mm long, flexuose, sometimes geniculate, brown below, green above, simple or with few lateral branches, often with a rejuvenation from beneath the female inflorescence. Rhizoids numerous on lower part of the stem and at the geniculations, not abundant on other regions, long, colorless. Leaves alternate, succubous but nearly transverse, not decurrent, distant below and subimbricate above, erect-spreading, simply 2-lobed, quadrate to cuneiform, even those on sterile stems wider than the stem, smooth on back, slightly

¹⁶⁴ There are some errors in Pearson's plate. The smaller of the figures 19 evidently should have been numbered figure 17. Figure 11, two leaves, should have been numbered 10 and 11. Three figures 18 leave some doubt as to which one is the female bracteole.

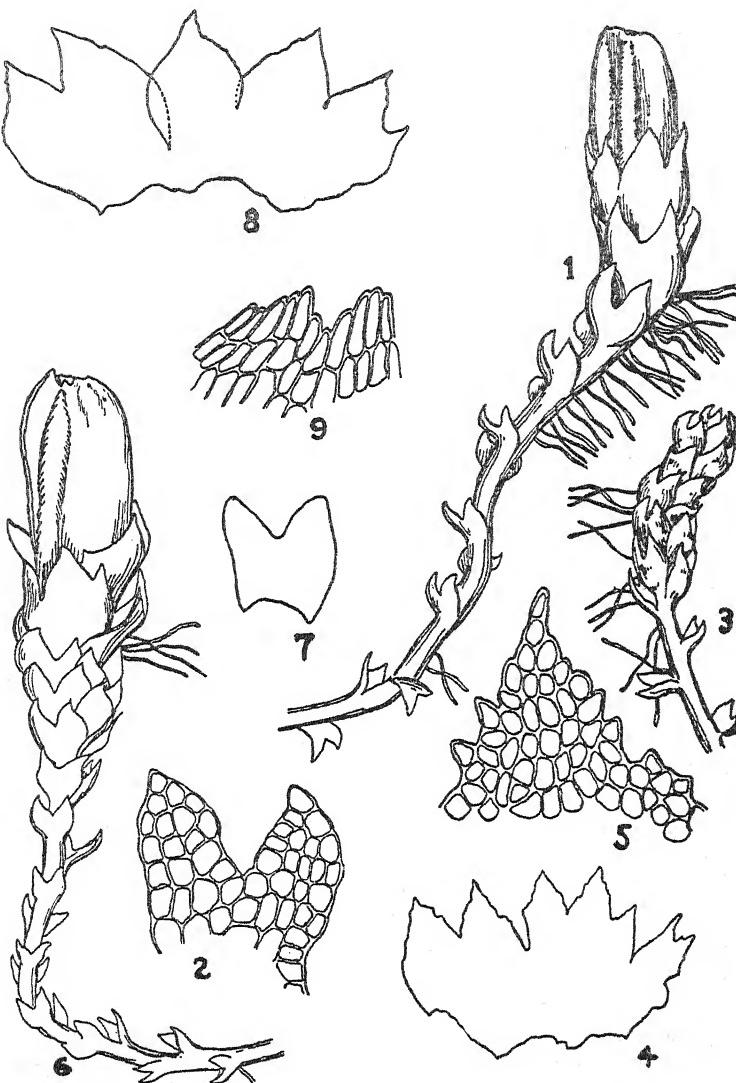
¹⁶⁵ stēl lū lif' ēr ē.

¹⁶⁶ stēl lū lif' ēr ā.



Cephaloziella stellulifera. 1, Female bracts and bracteole (*b*), $\times 18.5$. 2, Leaf, $\times 32$. 3, Leaf, $\times 27$. 4, Tip with female inflorescence and antheridia (*a*) just beneath it, $\times 10.6$. 5, Part of mouth of perianth, $\times 93$. 6, Tip with female inflorescence and underleaves (*u*), $\times 21$. 7, Lobe of leaf, $\times 74$. 8, Tip with perianth, $\times 10.6$. 9, Part of sterile stem, $\times 16$. (5, after Jensen; 7, after Douin; the others after K. Mueller.)

concave; those on fertile stems much larger toward the inflorescence, oval-quadrata, squarrose; leaves entire on the sterile stems, remotely denticulate when near the perianth; lobes of leaves of sterile stems lanceolate, usually divaricate, acute, convex, rarely somewhat incurved, 4-6 cells wide at the base, those of fertile stems wider; sinus descending $\frac{1}{2}$ - $\frac{3}{5}$ the leaf length; obtuse to broadly acute. Cells of the leaves 16-21 μ , oblong-quadrata; walls slightly and nearly equally thickened; trigones not or hardly present; cuticle smooth. Gemmae on the margins of the upper leaves and underleaves, ellipsoid, 1-2-celled, green. Underleaves always present but often hidden or disappearing on older parts; on sterile stems small, subulate or 2-lobed; toward the female inflorescence often large, triangular-subulate to ovate-subulate, with or without a tooth on one margin. Plants bisexual. Male inflorescence just below the female one; male bracts grading into leaves downwards and female bracts upwards; antheridia 1-2, oval, with short stalk. Female inflorescence terminal on a normal branch; female bracts much larger than the leaves, 2-3-lobed for $\frac{1}{3}$ - $\frac{1}{2}$, their lobes ovate-lanceolate and crenulate-dentate to dentate but sometimes also with 1-2 spinulose teeth; bracteole oblong-quadrata, 2-lobed for $\frac{1}{4}$ - $\frac{1}{3}$, the lobes acute and dentate but sometimes also with 1-2 large teeth, the bracteole united for half its length with both bracts to form a cup about the base of the perianth. Perianth ellipsoid-cylindrical, $\frac{2}{5}$ - $\frac{1}{2}$ -emergent, deeply plicate above, gradually narrowed to the mouth; mouth crenulate-dentate by slightly projecting elongate cells. The name from *L. stellula*, a little star, and *fero*, I bear; in reference to the stellate appearance of the buds in end view, due to the diverging lobes of the leaves or bracts.—On soil.



Cephaloziella stellulifera var. *gracillima*. 1, Plant with perianth, side view, $\times 50$. 2, Leaf cells, $\times 210$. 3, Shoot with male inflorescence, $\times 50$. 4, Two female bracts with bracteole at right, $\times 50$. 5, Tip of female bract, $\times 210$. 6, Plant with perianth, $\times 50$. 7, Leaf, $\times 70$. 8, Two female bracts with bracteole between them, $\times 50$. 9, Part of mouth of perianth, $\times 210$. (All after Clark and Frye.)

ILLUSTRATIONS: Macvicar (374) 268, figs. 1-9;¹⁶⁷ K. Mueller (409) 2: fig. 40; Jensen (323.5) 221, 2 figs. and 229, 1 fig.; Douin, Soc. Bot. France, Mem. 29: pl. 7, fig. 74, and pl. 9, fig. 92, 1920; Douin, Bull. Soc. Bot. France 52, pl. 4, 1905.

EXAMINATIONS: N.Y. Cattaraugus County (Hubert 71) 1940.

TYPE LOCALITY: Near Crich in West Derbyshire, England (Wilson), 1833.

RANGE: N. Amer. (270.1, 56.55); Eur. (374).

11a. *Cephaloziella stellulifera* var. *gracillima*¹⁶⁸ Douin, Bull. Soc. Bot. France 52:259, 1905.

C. limprichtii Warnst. Krypt.-Fl. Mark Brandenburg 228, 1902.

C. gracillima Douin, Mem. Soc. Nat. Sci. Cherbourg 35:257, 1906.

C. stellulifera var. *limprichtii* Macvicar Student's Handbook Brit. Hep., Ed. 2, 289, 1926.

Plants in patches, yellowish green to reddish brown. Leaves erect-spreading, smooth on back; lobes of the leaves near the perianth rather narrower than in the type. Cells of the leaves and bracts with walls slightly thicker than in the type. Underleaves smaller than in the type, constantly present, frequently readily found. Gemmae green, roundish ovoid, 1-2-celled. Plants bisexual or sometimes unisexual. Male bracts entire. Female bracts entire to weakly crenulate or slightly and obtusely dentate. Spores 9-12 μ , finely papillose, reddish brown. The name from the L. *gracillimus*, most elegant; in reference to its appearance, but not particularly true of this species as compared with others of the same genus.—On damp sandy or clayey soil.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 39; Clark & Frye (81) 108, figs. 1-9; Jensen (323.5) 221, 2 figs.; Meylan (386) fig. 158; Douin, Soc. Bot. France, Mem. 29: pl. 1, fig. 4; pl. 6, fig. 47; pl. 7, fig. 67, 1920; Douin, Revue Gen. Bot. 28: pl. 13, figs. 30-33, 35-38; pl. 18, fig. 91, 1916; Warnstorff (523) 235, fig. 3.

EXAMINATIONS: None.

TYPE LOCALITY: "Blechernen Hahn" at Neuruppin, Germany (Warnstorff), 1884. About Lat. 52° 58' N., Long. 12° 46' E.

RANGE: Wash. (81), Cal. (202), Fla. (521.2); Eur. (460.1).

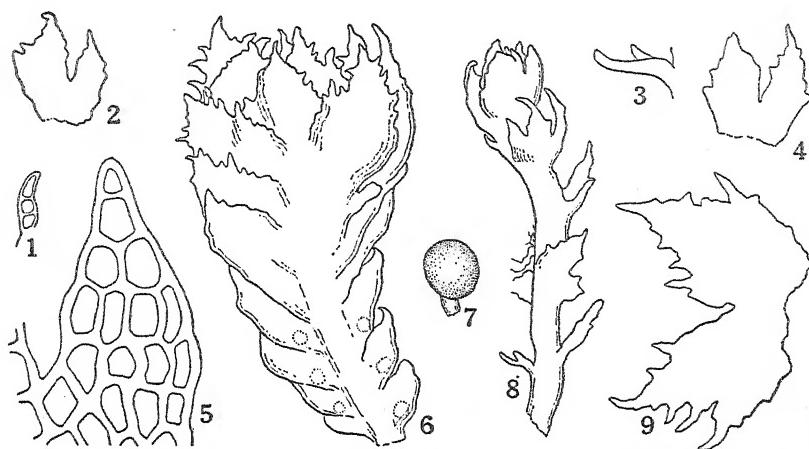
12. *Cephaloziella brinkmani*¹⁶⁹ Douin, Soc. Bot. France, Mem. 29:75, 1920.

Plants scattered among other bryophytes, green or brownish green to reddish. Stems 0.3-1 cm long, prostrate; branches few, lateral; subfloral innovations rather numerous. Rhizoids colorless, long, present to near apex of stem, scattered. Leaves alternate, somewhat to distinctly succous, not decurrent, distant or at apex imbricate, erect-spreading, simply 2-lobed, quadrate, 150-160 μ long, 130-140 μ wide, the back without teeth or cellular papillae, concave; margin unequally and acutely serrate-

¹⁶⁷ Macvicar (374) says that apparently Pearson had a mixture of this plant and *C. curnowii* when he described and figured *C. stellulifera* (433, pl. 68.).

¹⁶⁸ grá sil' lí mä.

¹⁶⁹ brink' män i. Douin spells it Brinkmanni. A letter to Mr. Brinkman brought forth his statement that he always writes his name Brinkman. We are, therefore, omitting one "n" from the original spelling of the name.



Cephaloziella brinkmani. 1, Underleaf, side view, x 143. 2, Leaf, x 102. 3, Underleaf, side view, x 143. 4, Leaf, x 102. 5, Lobe of a leaf, x 440. 6, Female branch, not quite mature, x 75. 7, Antheridium, x 102. 8, Tip of sterile stem, side view, x 61. 9, Two female bracts, x 102. (All original, by Elizabeth Curtis.)

dentate or the lower leaves of sterile shoots entire; lobes slightly unequal with the ventral the wider, ovate to oval-lanceolate, acute to apiculate, 4-10 cells wide at base; sinus descending $\frac{1}{2}$ - $\frac{3}{4}$ the leaf length. Cells of the leaf about 8 by 8-27 μ , quadrate or oval-hexagonal; walls equally considerably thickened; trigones wanting. Gemmae not seen. Underleaves present also on sterile stems, lanceolate to subulate, unlobed or 2-lobed, 51-76 μ long, some only 3-6 cells long and 3 cells wide; the larger ones 2-lobed, wider, with a tooth on one or both sides. Plants bisexual. Male inflorescence below the female one on the same shoot; male bracts somewhat larger than the leaves but not readily distinguished, 4-8, concave, antheridium 1. Female bracts about twice as long as the leaves of the normal sterile stems, 2-lobed for $\frac{2}{3}$ the length, almost twice as wide as long; lobes so coarsely toothed that some of the larger basal teeth may be considered lobes, acute to acuminate. Perianth not seen mature. Sporophyte unknown. Named in honor of A. H. Brinkman, a collector and botanist of Craigmyle, Alberta.—On rocks.

ILLUSTRATIONS: None.

EXAMINATIONS: B.C. Hector (Brinkman 704) 1912.

TYPE LOCALITY¹⁷⁰: Hector, British Columbia, Canada (A. H. Brinkman) 1911; on rocks at Lake Ohara, altitude 6400 feet.

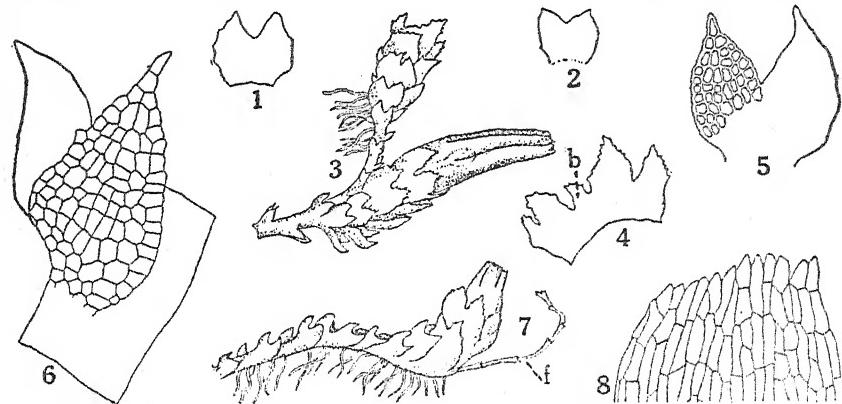
RANGE: B.C. (46.1).

¹⁷⁰ Douin (117.2) gives the type locality merely "Etats-Unis," a very large locality, and probably erroneous as to country. Mr. Brinkman lives at Craigmyle, Alberta, Canada, not over a day's journey from Hector, British Columbia, either by train or by automobile. So far as we know

13. *Cephaloziella elegans*¹⁷¹ (Heeg) K. Muell., Rabenh. Krypt-Fl. 6(2):128, 1912. Not of Schöffn., Lotos 48: in 1900.

Cephaloziella elegans Heeg, Revue Bryol. 20:82, 1893.

Plants in patches, dark green to brownish green. Stems 1-6 mm long, prostrate to erect, little branched; branches lateral in origin; rejuvenations sometimes 2-8 beneath the perianth. Rhizoids numerous to near apex of stem, rather long. Leaves alternate, succubous but almost transversely inserted, not decurrent, distant, or somewhat imbricate near the perianth and on young parts, erect-spreading, simply 2-lobed, quadrate to roundish, quite concave, about half embracing the stem, small, about 150 μ wide, smooth on the back; margins of the leaves of sterile stems entire, of those close to the inflorescences distantly toothed especially on the lobes; lobes triangular to ovate-triangular, acute or bluntly so, 5-12 cells wide at base; sinus descending $\frac{1}{3}$ - $\frac{3}{5}$ the leaf length, acute to obtuse or more rarely somewhat roundish. Cells of the leaves 6-12 μ , quadrate to hexangular; walls rather thin to uniformly thickish or on



Cephaloziella elegans. 1-2, Leaves from close below the female bracts, x 29. 3, Part of plant with perianth, x 29. 4, Female bracts and bracteole (b), x 29. 5, Leaf, x 143. 6, Leaf, attached, x 185. 7, Part of plant with perianth and flagellum (f), x 29. 8, Part of mouth of perianth, x 185. (6, 8, after Jensen; the others after K. Mueller.)

He reports it only from British Columbia. He kindly sent us two packets, both from Hector. In the isotype, collected in 1911, we did not find the plant. In the topotype, collected September 21, 1912, which we list under "examinations" it occurs intermingled with *Ptilidium californicum*, *Lophozia longidens* and *L. hatcheri*. The 1912 material was determined by Conklin and verified by us. From this the drawings were made. Hector is within 3 miles of the boundary between British Columbia and Alberta, and is about Lat. 51° 0' N., Long. 116° 4' W.
"el' e gāns."

those leaves near the perianth more thickened in the angles and the cell hollow somewhat rounded; trigones none to rather small and indistinct; cuticle smooth or verruculose. Gemmae 2-celled, about 8 by 14 μ , with thin walls. Underleaves present, more easily found near the tips of the stems, small to abortive, lanceolate to 2-lobed, acute or rarely obtuse. Plants bisexual. Male bracts just beneath the female ones and on the same stem or branch, similar to the leaves, about twice as large, distantly dentate, more concave. Female inflorescence terminal on normal shoots; female bracts larger than the leaves, broadly quadrate, 2-lobed to about $\frac{1}{2}$, the margin denticulate especially of the lobes, the lobes acute; bracteole much smaller than the bracts, ovate, somewhat denticulate, united for about half its length with both bracts to form a cup about the base of the perianth. Perianth cylindric to somewhat fusiform, $\frac{1}{2}$ - $\frac{3}{4}$ -emergent when mature, deeply plicate, gradually contracted to the mouth; mouth crenulate. Elaters 6-7 μ thick; spirals 2. Spores 6-7 μ , reddish brown. The name the *L. elegans*, delicate; in reference to its delicate stems with small distant leaves, a character which is, however, quite common in this genus.—On sandy soil, on cliffs among other bryophytes.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 35; Jensen (323.5) 221, 2 figs.

EXAMINATIONS: None.

TYPE LOCALITY: Schladming in Steiermark, at this writing a part of Germany (Heeg), August 20, 1890, at 1000 meters.

RANGE: Ont.¹⁷² (409); Asia (325); Eur. (409).

Meylan's (386) fig. 154 seems to be *C. myriantha* except that the cells are drawn with walls thick as those of *C. elegans*. Thus one is left in doubt.

14. *Cephaloziella sullivantii*¹⁷³ (Aust.) Evans, Rhodora 10:189, 1908.

Jungermannia divaricata of Sull. Musci Alleghaniensis, No. 239, 1845. Not of Sm. in Sowerby Eng. Bot. 10: pl. 719, 1800. Not of Nees Naturg. Eur. Lebmer. 2:241, 1836.

Jungermannia sullivantii Aust., Proc. Acad. Nat. Sci. Philadelphia 21(1869): 221, 1870.

Cephaloziella sullivantii Aust. Hep. Bor.-Amer. Exsic. No. 50, 1873.

Jungermannia raddiana Massal., Atti Soc. Venet. Trent. Sci. Nat. 6:2, 1879.

Cephaloziella raddiana Massal., Ann. Istit. Bot. Roma 2:31, 1886.

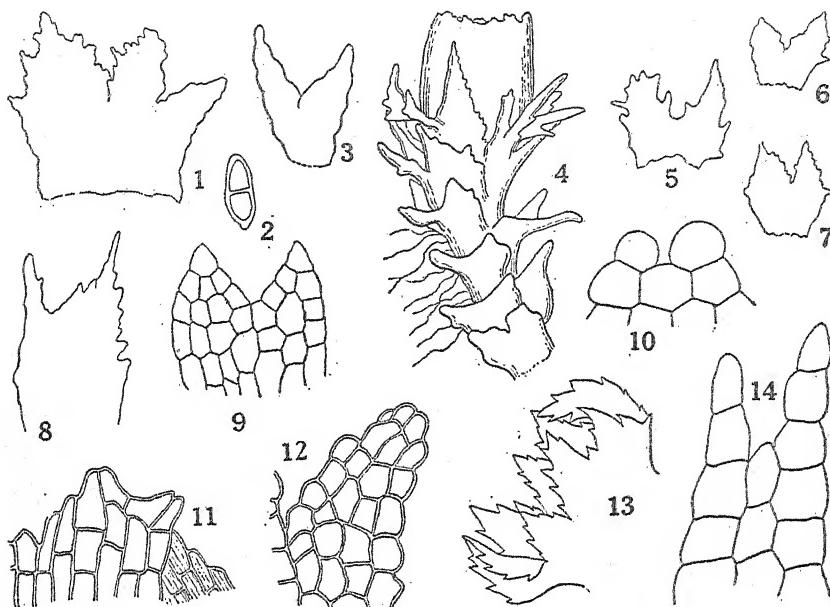
C. raddiana Schiffn., in Torre & Sarnthein Fl. Tirol, etc. 5:59, 1904.

C. myriantha var. *jaapiana* Schiffn., Oesterr. Bot. Zeitschr. 54:(5), 1904, in part, according to Douin in Soc. Bot. France, Mem. 29:58, 1920.

Plants very small, olive green; sterile leafy shoots 75-100 μ wide. Stems 0.5-1.5 mm long, prostrate with ascending tips, simple or little branched; branches ventral in origin. Rhizoids very numerous almost to the apex of the shoots, long, colorless. Leaves alternate, transversely to

¹⁷² We have not found the original report of this collection which Macvicar is said to have made in 1884, before the species was named. So far as we are aware this collection is the only basis for its occurrence in North America.

¹⁷³ sūl li ván' ti i.



Cephalozia sullivanii. 1, Female bract, $\times 143$. 2, Gemma, $\times 445$. 3, Large underleaf near female bracteole, $\times 127$. 4, Part of female branch with perianth, $\times 74$. 5-7, Leaves from near apical part of plant and grading toward perianth, $\times 75$. 8, Female bracteole, $\times 143$. 9, Normal leaf about middle of sterile stem, $\times 276$. 10, Abortive underleaf near base of stem, $\times 440$. 11, Part of mouth of perianth, $\times 440$. 12, Lobe of small leaf of sterile stem, $\times 334$. 13, Involucr, $\times 106$. 14, Underleaf just below bract-like leaves of female inflorescence, $\times 514$. (2, 13, after Douin; all others original; 1, 3-8, 11-12, by Elizabeth Curtis.)

slightly succubously inserted, not decurrent, imbricate, erect-spreading, simply 2-lobed, subquadrate to ovate, 142-500 μ long, 106-510 μ wide, smooth on back, often narrower than the stem; margin entire or nearly so but near the female inflorescence and within it more or less dentate-serrate; lobes 4-5 cells wide, straight, entire or in the larger leaves sometimes 1-2-toothed, acute; sinus descending $\frac{1}{2}$ - $\frac{3}{5}$ the leaf length, acute to obtuse. Cells of the leaves 10-13 μ but usually 11-12 μ ; walls thin, trigones wanting; cuticle smooth. Gemmae of 2 equal cells, elliptical, smooth. Underleaves common on the sterile stems, abortive below, 2-lobed above toward female inflorescence, the lobes a single row of 1-5 cells. Plant bisexual. Male inflorescence just below the female and on the same stem, not described in detail.¹⁷⁴ Female branch suberect, with larger leaves; female bracts larger than the leaves of sterile branches, free from each other, erect, 2-4-lobed for about $\frac{2}{5}$ their length; the lobes acute,

¹⁷⁴ We did not find it.

sharply serrate, 170-185 μ long, 153-170 μ wide; bracteole united with both bracts for $\frac{2}{5}$ - $\frac{1}{2}$ its length, 2-lobed, about 150 μ long, the margin bluntly toothed to sinuate. Perianth broadly ovoid to obovoid, about $\frac{1}{2}$ - $\frac{2}{3}$ -emergent, 255-330 μ long, 180-220 μ wide, with a few obtuse ridges and at tip a few more plicae, slightly contracted to the mouth, 1 cell thick to base, composed of cells 8-10 μ wide and 10-18 μ long; mouth about $\frac{3}{4}$ as wide as the perianth, sometimes narrowly scarious, crenulate by projecting cells. Sporangium ovoid, otherwise unknown. Named in honor of W. S. Sullivant, a noted American bryologist.—On trunks of trees and on logs.

ILLUSTRATIONS: Meylan (386) fig. 155; Douin, Soc. Bot. France, Mem. 29: pl. 2, figs. 50, 66, 1920.

EXAMINATIONS: Me. Canton Point in Oxford County (Parlin 11633) 1933.—Wis. Lake Nebagamon in Douglas County (Conklin 1203) 1912.

TYPE LOCALITY: Near Columbus, Ohio (W. S. Sullivant).

RANGE: Me. (430), N.H. (169), Mass. (168), N.J. (21), Ont. (373), Ohio (21), Mich. (415), Ill. (504), Wis. (98); Eur. (117, 23).

We saw no plant over 1 mm long, and found no sporangia. Stephani (Sp. Hep. 3:324) comments on the absence of serrations on the leaves of the Ohio material. We did not have the opportunity of examining the type, but consider it possible that on small plants they might have been overlooked, since the teeth are chiefly on the larger leaves of the female branch.

15. *Cephaloziella myriantha*¹⁷⁵ (Lindb.) Schiffn. Bryologische Fragmente 12, Oesterr. Bot. Zeitschr. 54: in 1904.

Cephalozia myriantha Lindb., Medd. Soc. Fauna Fl. Fennica 1: 1875, in part.

Cephalozia jackii Limpr. in Spruce, On *Cephalozia* 67, 1882.

C. jackii Schiffn. Bryologische Fragmente 4, Oesterr. Bot. Zeitschr. 54: in 1904.

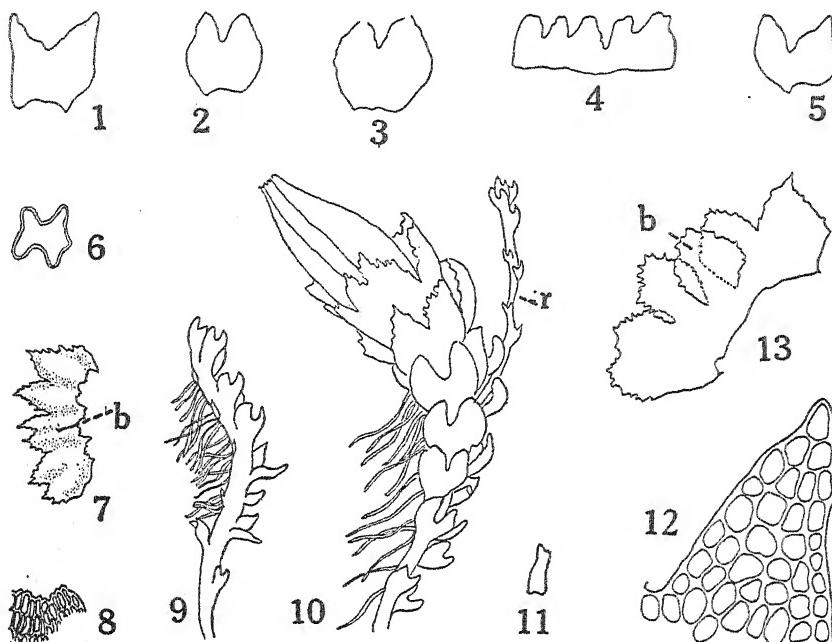
*C. tackii*¹⁷⁶ Young, Trans. Proc. Bot. Soc. Edinburgh 23:93-98, 1905.

Plants in patches, green to reddish or blackish brown. Stems 2-7 mm long, prostrate to decumbent or ascending, simple or with few branches. Rhizoids numerous to near apex of stem, long. Leaves alternate, transversely inserted, not decurrent, distant or near tip of stem somewhat imbricate, erect-spreading, simply 2-lobed, roundish-quadrata, strongly concave, about 150 μ wide, smooth on the back, those of sterile stems not much wider to little narrower than the stem; margin entire or near the perianth denticulate especially on the lobes; lobes triangular to ovate-lanceolate, acute or roundedly so, those of sterile stems 4-5 cells wide at base; sinus descending $\frac{1}{2}$ - $\frac{3}{5}$ the leaf length, acute to obtuse. Cells of the leaves 12-15 μ , quadrata to hexagonal, the cell hollow somewhat rounded; walls rather strongly and almost equally thickened; trigones none or small; cuticle smooth or papillose; the papillae hyaline, hemispherical. Gemmae 2-celled, 10-18 μ long, 8-14 μ wide, grayish brown, with thin walls. Under-

¹⁷⁵ mi' ri än' thä.

¹⁷⁶ Probably a typographical error for *jackii*.

leaves sometimes almost wanting, usually common near the tips of the shoots, lanceolate to ovate, unlobed or rarely 2-lobed, otherwise entire. Plants bisexual. Male bracts usually just below the female ones and on



Cephalozia myriantha. 1-2, Leaves, $\times 35$. 3, Male bract, $\times 35$. 4, Mouth of perianth, spread out, $\times 64$. 5, Leaf, $\times 35$. 6, Cross section in upper third of perianth, $\times 35$. 7, Female bract and bracteole (b), $\times 25$. 8, Part of the mouth of the perianth, $\times 85$. 9, Sterile shoot, $\times 35$. 10, Part of plant with perianth and rejuvenation (r), $\times 35$. 11, Underleaf, $\times 35$. 12, Lobe of leaf, $\times 282$. 13, Female bracts and bracteole (b), $\times 35$. (7, 8, after Macvicar; the others after K. Mueller.)

the same stem or branch, much larger than the leaves, only slightly concave, margins of their lobes rather distantly dentate, otherwise like the leaves. Female inflorescence terminal on a normal shoot; female bracts much larger than the leaves, 2-lobed for $\frac{1}{3}$ - $\frac{1}{2}$ their length, their lobes dentate, margin sometimes decolorate, otherwise like the leaves, bracteole smaller than the bracts, ovate, not lobed, its margin dentate, united with both bracts for $\frac{1}{3}$ - $\frac{2}{3}$ its length and with them forming a cup about the base of the perianth. Perianth fusiform to narrowly oblong, about $\frac{1}{2}$ -emergent, deeply 4-6-plicate above, quite reddish below, gradually contracted to the mouth; mouth decolorate, 5-lobed; the lobes rather triangular, rounded to truncate, crenulate with elongate cells. Elaters about 7μ thick; spirals 2, closely wound. Spores $7-9 \mu$, smooth, reddish brown. The name from Gk. *myrios*, many, and *anthos*, flower; in reference to the

abundance of perianths, not more numerous however than in some other species, e.g., *C. elegans*.—On soil, on rotting wood, on bases of trees, on rocks.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 37; Macvicar (374) 290, figs. 1-5; Jensen (323.5) 221, 2 figs.

EXAMINATIONS: *Labrador*. Nain (David Potter) 1937.—*Mich.* Negaune in Marquette County (Nichols) 1935.—*Ont.* Quetico National Park (Drexler 2146) 1939.

TYPE LOCALITY: Ekenas, Elimo, Finland (Lindberg).

RANGE: Labrador, Me. (156), N.H. (359), Vt. (245), Mass. (119), R.I. (169), Conn. (212), N.Y. (258), Que. (178), Ont., Ill. (246.7), Mich., Wis. (98), Minn. (94.1), Alta. (51), Ariz. (184), N.C. (43); Asia (350); Eur. (409).

C. myriantha is very like *C. elegans*, except that the latter has the leaf lobes wider, the leaf cells smaller, the gemmae smaller, and the perianth rather longer for its width. Douin has referred the specimens of *C. myriantha* partly to several species, thus doing away with it entirely. Joergensen (323.5) has followed him in this. Perhaps it is better to retain *C. myriantha* until some one monographs the genus, so we are following K. Mueller (409) and Macvicar (374).

The confusion of this species with others has left quite uncertain the range of *C. myriantha*, as well as that of its closely related species.

ELACHISTAE¹⁷⁷

Backs of the leaves not papillose or the papillae merely thickened points of cell wall; plants bisexual; male inflorescence on separate shoots beneath the female inflorescence; female bracteole free from the female bracts. In place of a key, compare numbers 16-18 on folding chart following page 508.

16. *Cephaloziella elachista*¹⁷⁸ (Jack) Schiffn., Lotos 48:338, 1900.

Jungermannia elachista Jack, in Gottsche & Rabenh. Hep. Eur., Exsic. No. 574, 1873.

Cephalozia divaricata var. *confervoides* Aust. Hep. Bor.-Amer., Exsic. No. 54, 1873.

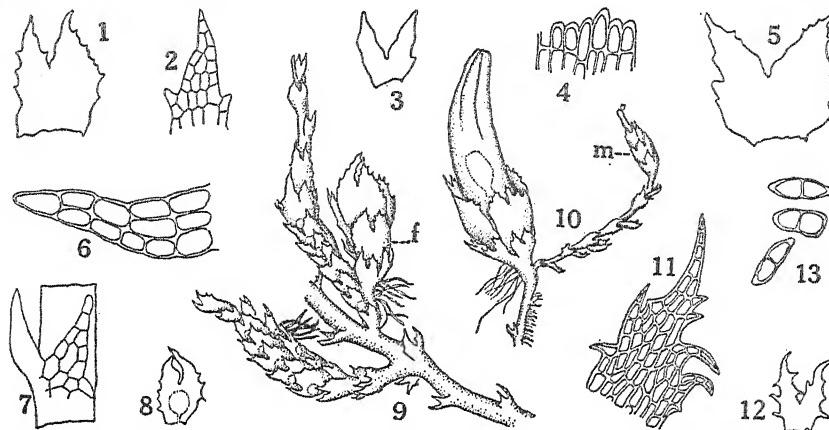
Cephalozia elachista Lindb., Acta Soc. Sci. Fennica 10:502, 1875.

Cephalozia (subgenus *Cephaloziella*) *elachistica* Spruce, On *Cephalozia* 70, 1882.

Plants creeping among other bryophytes, pale green. Stems 5-10 mm long, prostrate to ascending, delicate, flaccid, pale green, 20-30 μ thick, with elongate verruculae, often with proliferations beneath the perianth, dorsal epidermal cells large and hyaline; branches few, rather fleshy, ventral in origin. Rhizoids few, scattered, colorless. Leaves alternate, almost transversely inserted, not decurrent, distant or on female branches imbricate, erect-spreading, simply 2-lobed, ovate, about 175 μ long and 125 μ wide, smooth on the back, hardly wider than the stem; margin entire, or often one margin 1-toothed, or the margin with numerous blunt to sharp teeth; lobes about equal, lanceolate or triangular, acuminate, commonly somewhat connivent and incurved toward the stem, 3-5 cells wide at base; sinus descending $1\frac{1}{2}$ - $\frac{3}{4}$ the leaf length, acute to obtuse. Cells of

¹⁷⁷ è lăk' is tă.

¹⁷⁸ è lăk' is tă.



Cephaloziella elachista. 1, Female bract, x 45. 2, Leaf lobe, x 74. 3, Leaf of sterile shoot, x 45. 4, Part of mouth of perianth, x 148. 5, Female bract, x 45. 6, Tip of leaf, x 222. 7, Leaf of sterile shoot, attached, x 93. 8, Male bract, x 45. 9, Part of plant with male and female (*f*) branches, x 29. 10, Male (*m*) branch growing from a female branch, x 19. 11, Lobe of female bract, x 74. 12, Leaf, x 45. 13, Three gemmae, x 371. (2, 11, after Douin; 7, after Jensen; the others after K. Mueller.)

the leaf middle 14-30 μ , toward base 20-35 μ , mostly rectangular; walls thin; trigones wanting; cuticle usually smooth but occasionally with some flattish verruculae. Gemmae on the tips of the uppermost contorted leaves of flagelliform shoots, ellipsoid, about 24 by 10 μ , 2-celled, bluish green. Underleaves wanting to minute or distinct, subulate or 2-lobed. Plants bisexual. Male inflorescence near the female one, terminal or farther down, on separate branch, spicate; male bracts several pairs, larger than the leaves, 2-lobed to $\frac{1}{2}$ their length, concavely imbricate; the lobes strongly acute to acuminate, usually dentate. Female inflorescence on a short or somewhat elongate branch; bracts much larger than the leaves, 2-lobed to about $\frac{1}{2}$ their length; the lobes lanceolate to triangular, spinose-dentate to spinose-ciliate especially on their outer margins, their teeth often recurved; bracteole slightly smaller than the bracts, like them in form, free from the bracts, 2-lobed, the lobes spinose-dentate. Perianth ellipsoid-cylindric, 1.5-3 mm long, 300-400 μ thick, green, about $\frac{3}{4}$ -emergent, terete or commonly 3-angled in the upper third, gradually narrowed to about $\frac{1}{2}$ the diameter or less at mouth; mouth crenulate with bulging cells. Sporangium ellipsoid, reddish brown. Elaters 150-200 μ long, 7-10 μ thick; spirals 2, loosely coiled, reddish brown. Spores 10-11 μ , distinctly but minutely papillose, reddish brown. The name the Gk. *elachistus*, the smallest; in reference to the plant as a whole.—Among other bryophytes on very damp peaty soil; on rotten wood in a bog; among peat moss.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 30; Pearson (433) 2: pl. 71; Macvicar (374) 291, figs. 1-5; Jack, Gottsche & Rabenhorst Hep. Eur. Exsic., pl. with No. 574, except figs. A and B, 1873; Douin, Soc. Bot. France, Mem. 29: pl. 2, fig. 61; pl. 7, fig. 69; pl. 9, fig. 97, 1920; Jensen (323.5) 221, 2 figs.

EXAMINATIONS: None.

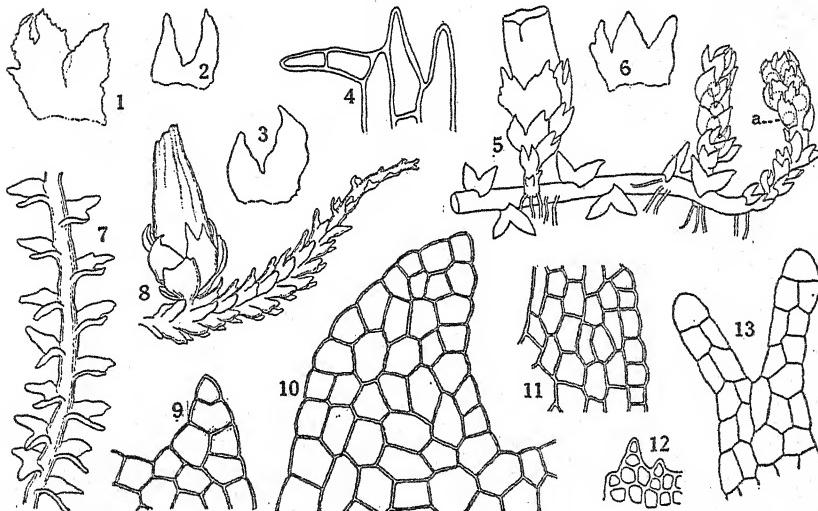
TYPE LOCALITY: Between Ueberlingen and Salem in Baden, Germany (Jack) 1870. Distributed as Gottsche & Rabenhorst, Hep. Eur. Exsic. No. 574.

RANGE: Cape Breton Isl. (413), N.S. (53.2), Me. (168), N.H. (159), Vt. (53), Mass. (169), R.I. (164), Conn. (203), N.J. (409), N.Y. (58), Mich. (416), Wis. (98), Alta. (51), B.C. (412.1); Eur. (409).

17. *Cephaloziella hyalina*¹⁷⁹ Douin, Soc. Bot. France, Mem. 29:77, 1920.

C. rambolitanensis Douin, Revue Gen. Bot. 28:281, pl. 15, 1916, according to Douin in Soc. Bot. France, Mem. 29:77, 1920.

Plants thinly spread over sandy soil, green to reddish brown; leafy shoots 185-440 μ wide. Stems 2-6 mm long, prostrate with ascending tips and branches, 50-65 μ in diameter; branches ventral; subfloral innovations rare; cross section of stem showing quite numerous cells; surface cells 16-33 μ long, 10-15 μ wide, thin walled. Rhizoids rather numerous, long,



Cephaloziella hyalina. 1, Female bract, $\times 25$. 2-3, Leaves, $\times 80$. 4, Small part of mouth of perianth, $\times 352$. 5, Plant with male and female branches, with antheridia (a.), $\times 12.7$. 6, Underleaf not far below the female bracteole, $\times 80$. 7, Part of sterile plant, dorsal view, $\times 25$. 8, Part of plant, with female branch, $\times 19$. 9, Lobe of small leaf, $\times 352$. 10, Lobe of large leaf, $\times 352$. 11, Cells at base of leaf lobe, $\times 193$. 12, Margin of lobe of female bract, $\times 115$. 13, Underleaf of sterile stem, $\times 352$. (5, after Douin; all others original; 1-4, 6-8, 11-12, by Elizabeth Curtis.)

¹⁷⁹ hī à lí' nā. We do not consider the Douin citation the original, either the name or its synonym, but we cannot find the original. We find no reference by Douin himself to the original publication, although he reduces *C. rambolitanensis* to *C. hyalina*.

colorless. Leaves alternate, transversely to quite succubously inserted, not decurrent, distant to contiguous, erect-spreading to spreading, simply 2-lobed, ovate or obovate to invertedly triangular on account of the spreading lobes, 270-470 μ long, smooth on the back, somewhat to strongly concave; margin entire; lobes of normal sterile branches 3-6 cells wide, spreading, triangular to ovate, acute, the tips bent forward; sinus descending $\frac{1}{2}$ - $\frac{2}{3}$ the leaf length, acute to rounded. Cells of the leaf 12-24 μ , polygonal, isodiametric to twice as long as wide, walls but little thickened; trigones wanting; cuticle smooth. Gemmae not seen. Underleaves not present throughout, from wanting to abortive or distinct on the same stem when well developed, 2-3-lobed for $\frac{1}{2}$ - $\frac{3}{4}$ their length; the lobes triangular to ovate or lingulate, acute. Plants bisexual. Male inflorescence terminal on a main shoot or on a ventral branch; male bracts 2-lobed, the lobes entire to somewhat dentate; antheridium 1. Female inflorescence on a short ventral modified branch; female bracts about twice as long as the leaves of normal sterile stems, 2-lobed for about $\frac{2}{3}$ their length, free; the lobes wide, acute, somewhat distantly dentate to almost entire, bracteole free from the bracts. Perianth ellipsoid or shortly cylindric, $\frac{1}{2}$ - $\frac{3}{5}$ emergent, 3-4-plicate nearly to base, with additional plicae near tip, the cells of the upper half about 9 by 20 μ , of the lower half about 16 by 20-30 μ ; mouth $\frac{3}{5}$ as wide to as wide as the perianth, somewhat crenulate by projecting cells and somewhat lobed. Sporophyte unknown. We do not know why the name *hyalina*.—On damp earth.

ILLUSTRATIONS: Douin, Revue Gen. Bot. 28: pl. 15, 1916.

EXAMINATIONS: Fla. Sanford (Rapp 78), without date.

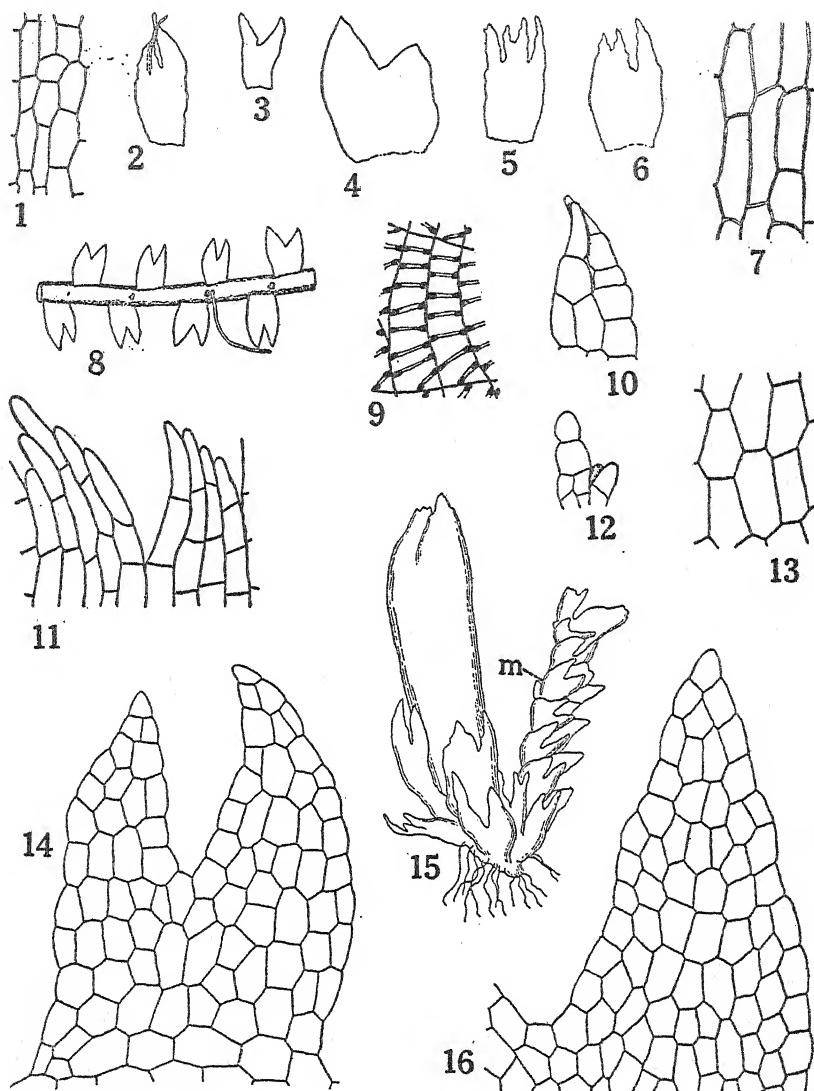
TYPE LOCALITY: "Florida." Probably near the town of Sanford.

RANGE: Fla. (52), Ga. (52); Eur. (117.15).

18. *Cephaloziella obliqua*¹⁸⁰ Douin, Revue Gen. Bot. 28:319, 346, 1916.

Plants solitary or in thin patches or small mats, green to yellowish green or brownish green; leafy shoots 0.4-1.2 mm wide, commonly 700-800 μ wide. Stems 0.2-10 mm long, prostrate or the branches ascending to erect, 70-130 μ thick, unbranched or with few to numerous ventral branches; cortical cells 24-64 μ long, 9-23 μ wide, 2-4 times as long as wide, with thin walls. Rhizoids few to moderately numerous, colorless, short to rather long. Leaves alternate, distinctly to very succubous, not decurrent, distant on sterile shoots, imbricate near the female bracts, spreading, simply 2-lobed or occasionally with an additional lobe or tooth on the dorsal margin, quadrate to elliptic, commonly averaging about 365 μ long and 245 μ wide, without dorsal papillae; margin entire; lobes

¹⁸⁰ öb lik' wä.



Cephaloziella obliqua. 1, Epidermis of small stem, surface view, x 222. 2, Female bracteole, x 41. 3, Leaf, x 68. 4, Leaf, x 22. 5-6, Female bracts, x 41. 7, Epidermis of well developed stem, surface view, x 222. 8, Part of sterile shoot, ventral view, x 34. 9, Thickening in walls of inner layer of sporangium, x 593. 10, Male bracteole, x 222. 11, Part of mouth of perianth after exsertion of sporangium, x 222. 12, Underleaf, x 222. 13, Cells of perianth about 2/3 down, x 222. 14, Leaf, the larger lobe ventral, x 222. 15, Tip of plant with male (m) inflorescence and perianth, x 34. 16, Ventral lobe of large leaf, x 222. (All original; 2-6, 15, by Elizabeth Curtis.)

4-14 cells wide at base but commonly only 4-10, acute, triangular to ovate, inclined to be unequal with the ventral the larger; sinus descending $\frac{2}{5}$ - $\frac{3}{5}$ the leaf length, acute or more rarely right-angular. Cells of the leaves 15-48 μ , isodiametric to 1.5 times as long as wide, much the same throughout the leaf; walls thin; trigones wanting; cuticle smooth. Gemmae unknown. Underleaves wanting to rudimentary or on young shoots sometimes well developed but small, near the female bracts somewhat 2-lobed. Plants bisexual. Male inflorescence terminal on short ventral branches arising below the female inflorescence; male bracts smaller than those of the stems from which the male branches arise, 2-lobed, entire; male bracteole 2-lobed, entire, its lobes only 1 cell wide and 2-3 cells long; antheridium 1. Female inflorescence terminal on a main shoot or commonly a short modified ventral shoot; female bracts about as large as the largest leaves of sterile stems, 2-4-lobed to about $\frac{1}{3}$ - $\frac{3}{5}$ their length, ovate to oblong, entire to sinuate or rarely with a few marginal teeth, the lobes acute; bracteole 2-lobed for about $\frac{2}{5}$ the length, entire to sinuate, not or but little united with the bracts, the lobes acuminate. Perianth cylindric, about $\frac{2}{3}$ emergent; its cells thin walled, the upper about $\frac{3}{4}$ times as long as wide, $\frac{1}{3}$ from the base of perianth, cells about isodiametric; mouth about half the diameter of the perianth, somewhat lobed, crenulate with projecting cells. Sporangium ellipsoid, 2-3 times as long as thick. Elaters 90-160 μ long, 6-7 μ thick; spirals 2, brown. Spores 8-13 μ , smooth, brown. The name the L. *obliquus*, slanting; evidently in reference to the quite succubous leaves.—On sandy peaty soil; on logs in swamps.

ILLUSTRATIONS: Douin, Revue Gen. Bot. 28: pl. 18, fig. 87 and pl. 19, fig. 103, 1916.

EXAMINATIONS: Fla. Sanford (S. Rapp 79) 1920; also Sanford (S. Rapp, unnumbered) Apr. 13, 1921, and associated with the name *rappifolia*.

TYPE LOCALITY: Sanford, Florida (Severin Rapp).

RANGE: Fla. Known only from Sanford.

The reproductive structures and sporophyte of *C. obliqua* were probably wanting in the type material, for they were not described. They were also wanting in Rapp's No. 79, probably isotype. They were present in the 1921 material, which we were permitted to examine through the kindness of Mr. Brinkman. All reproductive and sporophytic structures were drawn from the latter material.

HAMPEANAE¹⁸¹

Backs of the leaves without papillae composed of projecting cells; plants bisexual; male inflorescence on separate shoot below the female inflorescence; female bracteole united with 1 or both bracts.

In place of a key, compare numbers 19-26 on folding chart following page 508.

¹⁸¹ hām pē ā' nē.

19. *Cephaloziella hampeana*¹⁸² (Nees) Schiffn., in Loeske Moosfl. Harzes 92, 1903.

Jungermannia hampeana Nees Naturg. Eur. Leberm. 3:560, 1838.

Jungermannia dentata Limpr. Krypt.-Fl. Schlesien 1:293, 1876. Not of Raddi, Mem. Soc. Ital. Sci. Modena 18:32, 1818.

Cephalozia divaricata Heeg Leberm. Niederoesterreich 95, 1893, in part. Not of Dum. Hep. Eur. 89, 1874.

Cephalozia hageni Bryhn, Revue Bryol. 26:21, 1899.

C. trivialis Schiffn., Lotos 48:341, 1900.

Cephalozia bryhnii var. *elongata* Bryhn, Nyt. Mag. Naturv. 40:1, 1902.

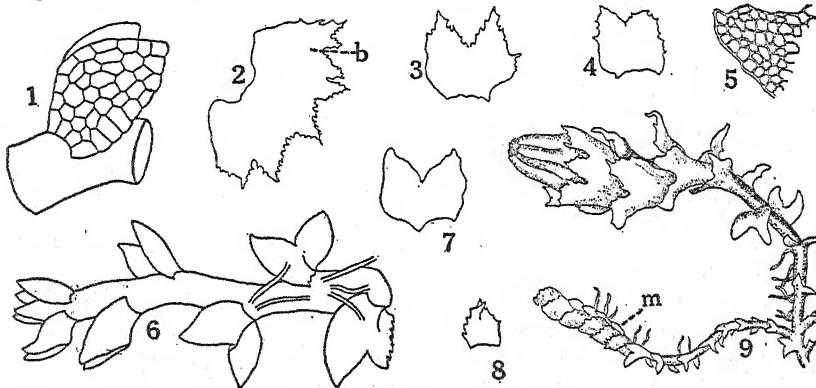
C. divaricata Warnst. Krypt.-Fl. Mark Brandenburg 1:233, 1903, in part.

C. erosa Limpr. in Warnst. Krypt.-Fl. Mark Brandenburg 1:233, 1903.

Cephalozia erosa Massal., Malpighia 21:36, 1907.

Cephalozia hampeana var. *erosa* K. Muell., Rabenh. Krypt.-Fl. 6(2):164, 1913.

Plants in patches, green to brownish green. Stems 3-10 mm long, prostrate, rather weak, little branched. Rhizoids rather numerous, scattered, long. Leaves of sterile stems alternate, almost transversely inserted, not decurrent, distant, spreading to spreading-recurved, simply 2-lobed, broadly cuneate to subquadrate, smooth on the back, the smaller ones rather wider than the stem; leaves near female inflorescence larger and loosely imbricate; margins entire to somewhat toothed in addition to the apical lobing; lobes triangular to ovate, acute to subacute, mostly divariccate, 4-10 cells wide at base; sinus descending $\frac{1}{2}$ - $\frac{2}{3}$ the leaf length, widely acute to obtuse. Cells of the leaf middle 11-18 μ , of the other parts little different, polygonal; walls thin; trigones wanting; cuticle smooth. Gemmae common, on the margins of the younger leaves, about 15 μ wide and 20 μ long, 2-celled, brownish. Underleaves rare or wanting other than close



Cephaloziella hampeana. 1, Leaf, attached, x 74. 2, Female bracts and bracteole (b), x 21. 3, Leaf just below female bract, x 21. 4, Male bract, x 58. 5, Tip of leaf lobe, x 116. 6, Tip of plant, ventral view, x 32. 7, Leaf, x 58. 8, Underleaf just beneath the female bracteole, x 21. 9, Plant with male (m) branch and perianth, x 21. (1, after Jensen; 6, after Douin; the others after K. Mueller.)

¹⁸² hām pē ā' nā.

to female bracteole, grading from lanceolate to ovate, the larger above. Plants bisexual. Male inflorescence terminal or farther down on ordinary branches; main bracts 12-40, larger than the leaves, closely imbricate, 2-lobed to about $\frac{1}{3}$, concave, the lobes broadly triangular, entire to slightly dentate with obtuse teeth. Female inflorescence terminal on stem or ordinary branch; female bracts much larger than the leaves, loosely surrounding the perianth, 2-lobed to $\frac{1}{3}$ their length; their lobes acute, sharply dentate to entire, with margins not different in color; bracteole narrower than the bracts but about the same in length, rather less deeply 2-lobed, united for $\frac{1}{4}$ - $\frac{3}{4}$ its length with both bracts and thus forming a loose cup around the perianth. Perianth ovoid-ellipsoid to cylindric, $\frac{1}{3}$ - $\frac{1}{2}$ -emergent, green throughout or somewhat hyaline above, with 4-5 rounded plicae in the upper half, gradually narrowed to about half its width at mouth; mouth slightly crenate to dentate with bulging cells. Elaters 8-9 μ thick; spirals loosely coiled, reddish brown. Spores 8-9 μ , minutely papillose, yellowish brown. Named in honor of E. Hampe, a pharmacist of Blankenburg, Germany, who first found the species.—On moist sandy or peaty soil, at sides of ditches, on old walls.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 46; Macvicar (374) 284, figs. 1-5; Jensen (323.5) 221, 3 figs.; Douin, Revue Gen. Bot. 28: pl. 12, figs. 16-17; pl. 13, figs. 39-40; pl. 16, fig. 73; pl. 17, fig. 82; pl. 19, fig. 95, 1916; Douin, Soc. Bot. France, Mem. 29: pl. 2, figs. 58-59; pl. 9, figs. 89, 91, 1920; Warnstorff (523) 235, fig. 6; Gil (76) fig. 269.

EXAMINATIONS: Ore. Sunset Bay in Coos County (Frye) 1929.—Wash. Pacific Beach (Foster) 1911.—Wyo. Centennial (Frye) 1931.

TYPE LOCALITY: Blankenburg, Germany (E. Hampe).

RANGE: Baffin Isl. (277.2), Melville Peninsula (277.2), Keewatin District of Canada (277.2), N.S. (53), Me. (369.1), N.H. (169), Vt. (164), Mass. (169), R.I. (200), Conn. (156), N.Y. (59), W.Va. (3.2), Ky. (218), Mich. (213), Wis. (98), Wyo. (83), Alta. (46.2), B.C. (46.1), Wash. (81), Ore. (82), Cal. (202); Asia (409); Eur. (460.2).

Since *C. hampeana* was confused with *C. divaricata* for a long time, all reports of it before 1909 when both Evans and Lorenz discussed the confusion, are in doubt.

20. *Cephaloziella arctica*¹⁸² Bryhn and Douin, by K. Muell. in Rabenh. Krypt-Fl. 6 (2) :159, 1913.

Cephalozia divaricata var. *verrucosa* C. Jens., Medd. om Groenland 15:374, 1897.

C. byssacea var. *verrucosa* Schiffn., Bryologische Fragmente 5, in Oesterr. Bot. Zeitschr. 54: in 1904.

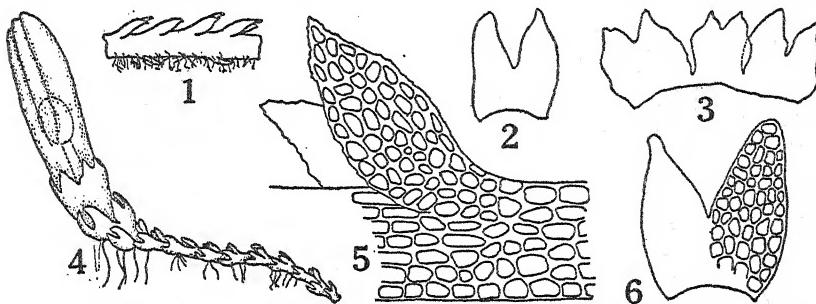
Cephalozia verrucosa Bryhn and Kaal., Bryhn in Rept. 2nd Norwegian Arctic Exped. in the "Fram" in 1898-1902, 11:45, 1906. Not of Steph. in Hedwigia 32:318, 1893.

C. verrucosa Bryhn and Kaal., Bryhn in Christiania Ved.-Selsk. Forh. No. 5, 1908, in part.

Plants in tufts or singly between bryophytes, delicate, brownish green. Stems 0.5-3 cm long, simple or usually with numerous branches from beneath the perianth; in cross section the cortical cells with very thin

¹⁸² ärk' tî kä.

walls, interior cells with somewhat thicker ones. Leaves alternate, transversely inserted, not decurrent, distant, almost applied to the stem, simply 2-lobed, quadrate, without papillae composed of projecting cells on the back, slightly concave, but little wider than the stem except near the perianth; margin entire; lobes lanceolate, bluntly acute, almost parallel, 5-8 cells wide at base; sinus descending $\frac{3}{5}$ - $\frac{3}{4}$ the leaf length, acute and narrow. Cells of the leaves 12-16 μ , with roundish cell hollows; walls quite thick; trigones moderately large but indistinct; cuticle verruculose. Gemmae unknown. Underleaves wanting or only occasionally present, well developed near the female bracts. Plants bisexual. Male inflorescence terminal on normal branches from beneath the perianth. Female bracts



Cephaloziella arctica. 1, Part of stem with 4 leaves and 2 underleaves, $\times 17$. 2, Leaf, $\times 106$. 3, Female bracts with bracteole between, $\times 35$. 4, Shoot with perianth containing immature sporophyte, $\times 29$. 5, Part of stem with one leaf, $\times 183$. 6, Leaf, $\times 162$. (1, 5, after C. Jensen; the others after K. Mueller.)

larger than the leaves, 2-lobed for $\frac{1}{3}$ - $\frac{1}{2}$ their length, or rarely unlobed or 3-lobed, broadly ovate; their lobes entire or nearly so, triangular to ovate, acute to bluntly so, of roundish cells; bracteole somewhat smaller than the bracts, 2-lobed, united with both bracts for about $\frac{1}{6}$ of its length and with them forming a cup which is closely applied to the perianth. Perianths clavate, $\frac{3}{4}$ - $\frac{4}{5}$ -emergent, often occurring successively on branches from beneath the previous perianth, gradually contracted to the mouth, composed of cells with quite thick walls; mouth decolorate, crenulate. Elaters about 8 μ thick; spirals 2, reddish brown. Spores 10-12 μ , minutely punctate, brown. The name from its arctic habitat.—On soil, among bryophytes.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 45; C. Jensen, Medd. om Groenland 15:375, figs. 1-3, 1898.

EXAMINATIONS: None.

TYPE LOCALITY: Scoresby Sound in East Greenland (N. Hartz) 1892.

RANGE: Greenland (320); Ellesmere Island (56.01); Pim Island (56.01); Cocked Hat Isl. (56.01); King William Land¹⁸⁴ (409); Eur. (459.02).

Details of the sporangium apparently have not been observed.

¹⁸⁴ This we think is probably what is now King William Island, about Lat. 69° N., Long. 94° W.

21. *Cephaloziella rubella*¹⁸⁵ (Nees) Warnst., Krypt.-Fl. Mark Brandenburg 1:231, 1902; emend. Douin, Revue Bryol. 41:6, 1914.

Jungermannia bifida Schreb., in Schmidel Icones Plant. et Analysis 3:250, pl. 64, fig. 2, 1787 (according to Lindberg; very doubtfully this plant according to Douin).

Jungermannia rubella Nees Naturg. Eur. Leb. 2:236, 1836.

Jungermannia divaricata Nees Naturg. Eur. Leb. 2:241, 1836. Not of Sm. in Sowerby Eng. Bot., pl. 719, 1800.

Cephalozia bifida Lindb. Musci Scand. 3, 1879.

Cephalozia divaricata Heeg, Leb. Niederoesterreich 95, 1893, in part. Not of Dum. Hep. Eur. 89, 1874.

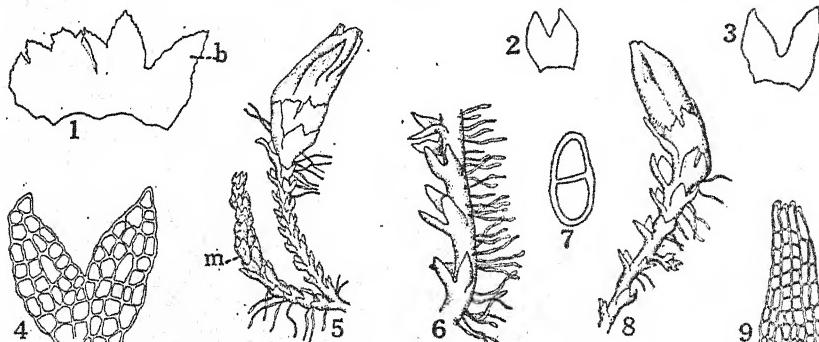
Cephalozia rubriflora C. Jensen, Revue Bryol. 20:68 and 105, pl. 2, 1893.

C. bifida Schiffn., Lotos 48:340, 1900.

C. divaricata Warnst. Krypt.-Fl. Mark Brandenburg 1:226, 1902, in part. Not of Schiffn., Engler and Prantl Pfl.-Fam. 3(1):99, 1895.

C. rubella var. *bifida* Douin, Soc. Bot. France, Mem. 29:83, 1920.

Plants in delicate patches or mats, dark brown to reddish brown. Stems 3-6 mm long, branched. Rhizoids numerous, short, present to near tip of stem. Leaves alternate, transversely to slightly succubously inserted, not decurrent, distant to approximate, erect-spreading to spreading, simply 2-lobed, broadly ovate, not wider than the stem on sterile stems, smooth on the back; lobes long-triangular to lanceolate, 2-5 cells wide but mostly 4, entire or rarely somewhat toothed, acute; sinus descending $\frac{1}{2}$ - $\frac{3}{4}$ the leaf length, acute to right-angular. Cells 10-15 μ or averaging 11-13 μ but occasionally reaching 18 μ ; walls distinctly thickened; trigones small or none; cuticle almost smooth. Gemmae undescribed and not seen by us. Underleaves wanting on sterile non-gemmparous stems or merely occasional ones occurring, lanceolate. Plants bisexual. Male branches arising near the base of the female one, wider than the sterile leafy shoots, elongate, male bracts larger than the leaves, closely imbricate,



Cephaloziella rubella. 1, Female bracts and bracteole (b), x 32. 2-3, Leaves, x 64. 4, Leaf, x 150. 5, Part of plant with perianth and male (m) branch, x 16. 6, Part of sterile shoot, x 48. 7, Gemma, x 667. 8, Tip with unruptured perianth, x 24. 9, Part of mouth of perianth, x 93. (7, after Douin; 9, after Jensen; the others after K. Mueller.)

¹⁸⁵ rū bē' lä.

concave, 2-lobed to about $\frac{1}{3}$; the lobes entire or rarely slightly toothed, acute; antheridium 1. Female inflorescence on the stem or an unmodified ventral branch; female bracts about 3 times as long as the leaves of sterile stems, slightly convex, 2-3-lobed for $\frac{1}{3}$ - $\frac{2}{3}$ their length, closely applied to the perianth; the lobes denticulate, mostly acute, their margins concolorous; bracteole similar to the bracts, united far up with one of the bracts. Perianth elliptic-ovoid to cylindric, about $\frac{2}{3}$ -emergent, 3-4-plicate in the upper part, often purplish about the middle and lower, becoming hyaline at the mouth, gradually and not greatly contracted to the mouth; mouth $\frac{1}{3}$ - $\frac{1}{2}$ the width of the perianth, dentate. Elaters about 8 μ thick, straight; spirals 2, reddish brown. Spores 7-10 μ , minutely papillose, reddish brown. The name the *L. rubellus*, reddish; from the color of the plant as a whole in the original collection.—On soil.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 43; Macvicar (374) 286, figs. 1-3; C. Jensen (323.5) 221, 2 figs. (as *C. bifida*); Meylan (386) fig. 157; Douin, Revue Bryol. 41:25, figs. 3-4, 1914; Douin, Soc. Bot. Fr., Mem. 29: pl. 9, fig. 83, 1920; Douin, Bull. Soc. Bot. France 60; pl. 12, fig. 60, 1913.

EXAMINATIONS: *La.* Fluker (Faith Pennebaker 306) 1938.—N.C. Hollow Rock, Durham (Blomquist 176) 1932.

TYPE LOCALITY: European.

RANGE: Me. (369.1), Vt. (193), Mass. (168), Conn. (168), Que. (178), Mich. (419.2), Wis. (98), Wyo. (82), Alta. (51), B.C. (46.1), Ore. (82), Ariz. (184), Colo. (175), La., N.C. (43), Va. (271); Asia (19.05); Eur. (323.5); Jan Mayen Isl. (320.4).

This species has been so greatly confused with *C. hampeana* and *C. diraricata* that reports of it before 1920 are very unreliable.

C. rubella var. *bryhnii* Douin, Soc. Bot. France, Mem. 29:84, 1920 (*Cephalozia bryhnii* Kaal., Nyt. Mag. 33:152, 1893). *Cephaloziella bryhnii* Douin, Revue Bryol. 41:18, 1914; but not of K. Muell., Rabenh. Krypt.-Fl. 6(2):150, 1913) has been reported from Ellesmere Island (56.01). Douin (Ann. Bryol. 1:52, 1928) remarks that Kaalaas applied the name to two plants, one of which was *Dichiton integrerrimum*. Whether the Ellesmere Island material is *C. rubella* var. *bryhnii* or *Dichiton integrerrimum* we have no means of determining.

The var. *bryhnii* is distinguished from *C. rubella* typica by the usual occurrence in the variety of the male inflorescence on separate shoots arising beneath the female inflorescence. It is distinguished from *C. bifida* by the lobes of the leaves and of the female bracts, which are obtuse to rounded in the variety.

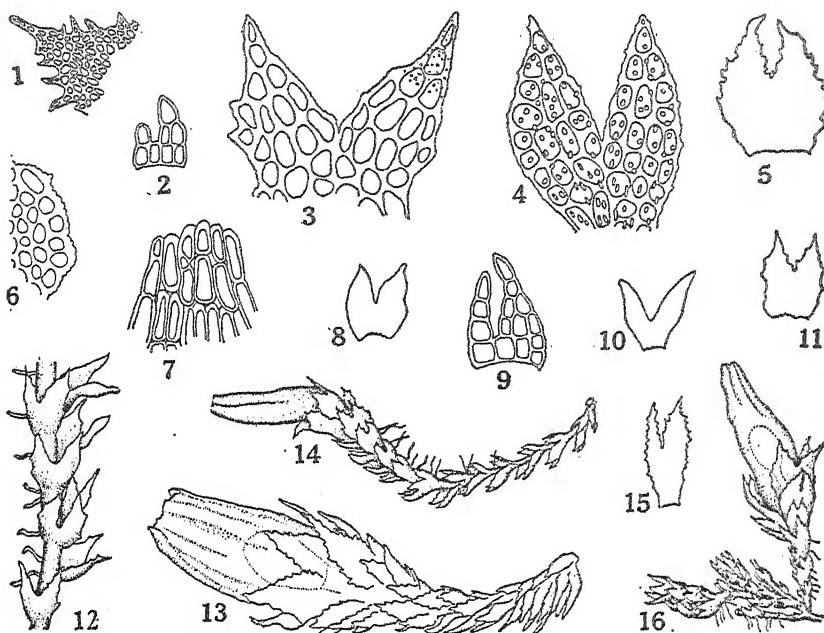
22. *Cephaloziella striatula*¹⁸⁶ (C. Jens.) Douin, Revue Bryol. 35:132, 1908.

Cephalozia striatula C. Jens., Revue Bryol. 31:25, 1904, in part.

Prionolobus striatus Schiffn. in Douin, Mem. Soc. Sci. Nat. Cherbourg 25:256, 1906.

Plants in very small patches, yellowish green. Stems 3-7 mm long, prostrate to ascending, with few ventral and fewer lateral branches, striate-verrucose. Rhizoids rather numerous, long, colorless. Leaves of sterile stems alternate, transversely inserted, not decurrent, distant, erect-spreading, simply 2-lobed, ovate to broadly cuneate, smooth on back,

¹⁸⁶ stri ät' ü lä.



Cephalosziella striatula. 1, Tip of female bract, x 83. 2, Underleaf, x 175. 3, Leaf, with verruculae shown at right tip, x 222. 4, Leaf, x 217. 5, Female bract, x 48. 6, Part of cross section of stem, x 175. 7, Part of mouth of perianth, x 217. 8, Leaf, x 58. 9, Underleaf, x 175. 10, Leaf, x 58. 11, Male bract, x 48. 12, Part of sterile stem, x 58. 13, Part of plant with perianth, x 39. 14, Shoot with perianth, x 27. 15, Female bracteole, x 48. 16, Part of plant with perianth and several male branches, x 27. (2, 4, 6-7, 9, 13, after Jensen; the others after K. Mueller.)

mostly wider than the stem; leaves larger toward perianth and loosely imbricate; margin entire, or below the female bracts somewhat dentate to spinulose, leaves of sterile stems lacking a spinous tooth at base, lobes straight or nearly so, lanceolate to triangular, acute, on sterile stems 4-5 cells wide at base; sinus descending $\frac{2}{3}$ - $\frac{3}{4}$ the leaf length, acute. Cells of the leaf 10-20 μ long, 7-12 μ wide, much the same in various parts, roundish to rectangular; walls thick; trigones moderately developed; cuticle from almost smooth to verrucose. Gemmae spherical. Underleaves smaller than the leaves, broadly subulate, almost entire to deeply 2-lobed, the lobes entire or rarely dentate. Plants bisexual. Male inflorescence terminal or farther down, on short modified branch near the female one, often purplish; male bracts larger than the leaves, imbricate, suberect, concave, 2-lobed to about $\frac{1}{2}$, the margin coarsely dentate. Female inflorescence on main stem or unmodified branch; female bracts much larger than the leaves, 2-lobed to $\frac{1}{3}$ - $\frac{1}{2}$, ovate; margin of bract and its lobes

unequally serrate; the lobes triangular-lanceolate, acute to acuminate, often connivent; the sinus acute; bracteole broadly lanceolate or oblanceolate, 2-lobed, sharply spinosely serrate, united with the bracts for about $\frac{1}{4}$ - $\frac{1}{3}$ its length. Perianth cylindric, about $\frac{2}{3}$ -emergent, united somewhat at base with the bracts, 3-angled and 5-plicate near tip, often reddish, faded at tip, gradually narrowed to mouth; mouth finely crenulate through projecting thick-walled cells. Sporangium oval-globose; innermost layer of wall cells with few semiannular thickenings. Elaters up to 100 μ long, 7-8 μ wide; spirals 2, loosely coiled. Spores 6-8 μ , smooth, yellowish brown. The name the *L. striatulus*, finely striate; in reference to the striate-verruculose cuticle of the stem.—On peaty soil, on *Sphagnum* and *Leucobryum*, on stems of plants at high altitudes.

ILLUSTRATIONS: C. Jensen, Revue Bryol. 31:26-27, 15 figs., 1904; Macvicar (374) 293, figs. 1-7; K. Mueller (409) 2: fig. 32; Meylan (386) fig. 156, A-D; Jensen (323.5) 215, 3 figs.; Douin, Revue Gen. Bot. 28: pl. 19, figs. 104-105, 1916.

EXAMINATIONS: None.

TYPE LOCALITY: Mora, state of Dalarne, Sweden (J. Persson), September 7, 1902. Mora is about Lat. 60° 56' N., Long. 14° 37' E.

RANGE: Greenland (324, 322); Alaska (190); B.C. (46.1); Eur. (325).

The leaves have a tendency to show a tooth on the margin below the middle. When this becomes sharp and marked the plants are referred to *C. striatula* var. *subdentata* (Warnst.) K. Muell., but the variety has not been found in the United States. In ours a sharp tooth can be found on some of the large leaves below the female bracts. C. Jensen (323.5) does not distinguish between *C. striatula* and the variety *subdentata*.

23. *Cephaloziella grimsulana*¹⁸⁷ (Jack) Douin, Soc. Bot. France, Mem. 29:79, 1920; not of K. Muell., Rabenh. Krypt.-Fl. 6(2):171, 1913.

Jungermannia grimsulana Jack, in Gottsche and Rabenh. Hep. Eur. Exsic. No. 526, 1872, in part.

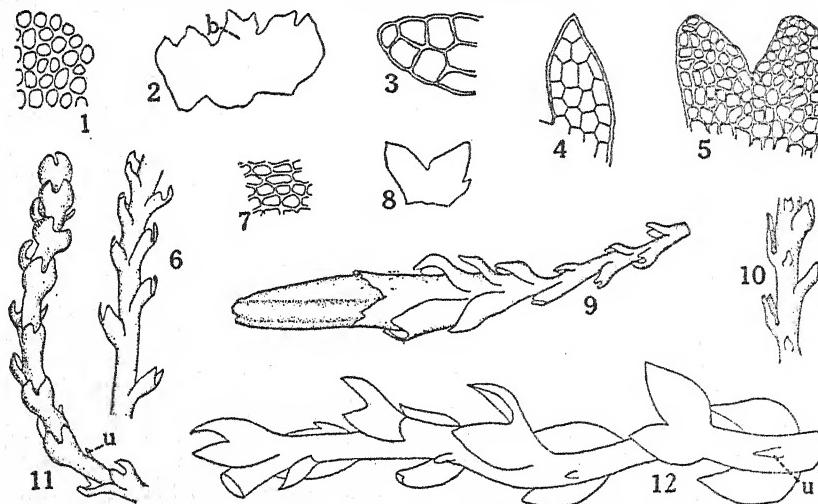
Cephalozia grimsulana Dum. Hep. Eur. 90, 1874.

Cephalozia divaricata var. *grimsulana* Kaal., Nyt. Mag. Naturvid. 33:158, 1893.
Hygrobiella kaalaasii Bryhn, in Arn. and Jens. Die Moose des Sarekgebirges 86, 1907.

Plants in dense tufts, greenish brown to blackish. Stems prostrate to ascending, 0.5-2 cm long, with few or no branches, often quite tenuous; the epidermal cells quadrate, with strongly thickened walls. Leaves alternate, transverse, not decurrent, distant or near the perianth somewhat imbricate, appressed on the most tenuous shoots, erect-spreading on the more vigorous shoots and the lobes incurved toward the stem, simply 2-lobed, quadrate or roundish to oval or even somewhat reniform, not toothed or papillose on the back, those of the sterile stems about 1.5-2 times as wide as the stem, those near the perianth larger; margin entire, or some of the leaves near the perianth with a single dorsal rounded tooth;

¹⁸⁷ grim" sū lā' nā.

lobes obtuse to usually rounded and incurved at tip, those from the middle of the sterile stems 6-10 cells wide at base; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, acute. Cells of the leaves 14-20 μ , roundish or ovaly polygonal; walls thin or of old leaves almost uniformly thickened; trigones none or small; cuticle smooth or papillose. Gemmae unknown. Under-leaves common, small, triangular to ovate, entire or nearly so, sometimes slightly 2-lobed, acute to obtuse. Plants bisexual. Male inflorescence terminal or farther down on normal wide-leaved shoots; male bracts slightly larger than the leaves, erect-appressed, 2-lobed, saccate below; the margin entire, the dorsal one incurved; the lobes small; the sinus $\frac{1}{3}$ - $\frac{1}{3}$ the bract length, acute to obtuse. Female inflorescence terminal; female bracts larger than the leaves, appressed, 2-lobed for $\frac{1}{5}$ - $\frac{1}{4}$; the margin irregularly toothed to crenate; the lobes triangular, acute to obtuse; the sinus $\frac{1}{4}$ - $\frac{1}{2}$ the bract length; bracteole united for $\frac{2}{3}$ - $\frac{2}{3}$ its length with both bracts, 2-lobed. Perianth ellipsoid to cylindric, 3-4-plicate for half its length or more, of quadrate or roundish cells with quite thick walls, slightly contracted at mouth; mouth evenly crenulate with thick walled and elongate projecting cells. Seta of 4 rows of cells. Elaters 10-12 μ thick; spirals loosely coiled. Spores 12-13 μ . The name from the place of



Cephalozia grimsulana. 1, Cells of the perianth, x 90. 2, Female bracts and bracteole (*b*), x 21. 3, Underleaf, x 239. 5, Leaf, x 116. 6, Part of plant, dorsal view, x 32. 7, Epidermal cells of stem, surface view, x 116. 8, Leaf near female bracts showing dorsal tooth, x 32. 9, Part of plant with perianth, x 21. 10, Part of plant, ventral view, x 32. 11, Part of plant, lateral view, showing underleaves (*u*), x 32. 12, Part of plant showing underleaves (*u*), x 58.

Cephalozia grimsulana var. *angustiloba*. 4, Lobe of leaf of sterile stem, x 148. (4, 12, after Douin; the others after K. Mueller.)

its original discovery, Lake Grimsel, and L. -anus, pertaining to.—On damp rocks in sunny places.

ILLUSTRATIONS: Gil (76) fig. 266; Douin, Revue Gen. Bot. 28; pl. 19, figs. 101-102, 1916; Douin, Soc. Bot. France, Mem. 29: pl. 8, fig. 73, 1920.

EXAMINATIONS: None.

TYPE LOCALITY: Beside Lake Grimsel in Switzerland (Jack) 1871, at 1870 meters.

RANGE: Greenland (56.01); Ellesmere Isl. (322); Spitzbergen (56.01); Eur. (103.3).

Joergensen (325) remarks that K. Mueller described the variety *alpina* rather than typical material. This seems to be the case from the size of cells and the lobes of the leaves he describes. Neither the size of the cells nor the width of the lobes of the leaves is impressive, and becomes less so when one considers the narrow lobes of *C. grimsulana* var. *angustiloba*. The real distinction is the bisexual or unisexual character. If that is in error we would consider *C. alpina* a synonym of *C. grimsulana*. Douin (117.2) says *C. grimsulana* is bisexual with the male inflorescence on separate branches. There is therefore a good deal of confusion concerning reports of occurrence between *C. grimsulana* and *C. alpina*.

23a. *Cephaloziella grimsulana* var. *angustiloba*¹⁸⁸ (Douin) Joerg., Bergens Mus. Skrift. 16:104, 1934.

C. angustiloba Douin, Soc. Bot. France, Mem. 29:70, 1920.

Leaf lobes only 4-5 cells wide, acute. Leaf cells 12-15 μ . Lobes of the female bracts 8-12 cells wide, with few teeth, their walls thick and papillose. The name from L. *angustus*, narrow, and *lobus*, lobe; in reference to the narrow lobes of the leaves.

ILLUSTRATIONS: Douin, Soc. Bot. France, Mem. 29: pl. 9, fig. 98, 1920.

EXAMINATIONS: None.

TYPE LOCALITY: "Etats-Unis."

RANGE: N. Amer. north of Mex. (56.55); Caucasus Mts. (325); Eur. (325).

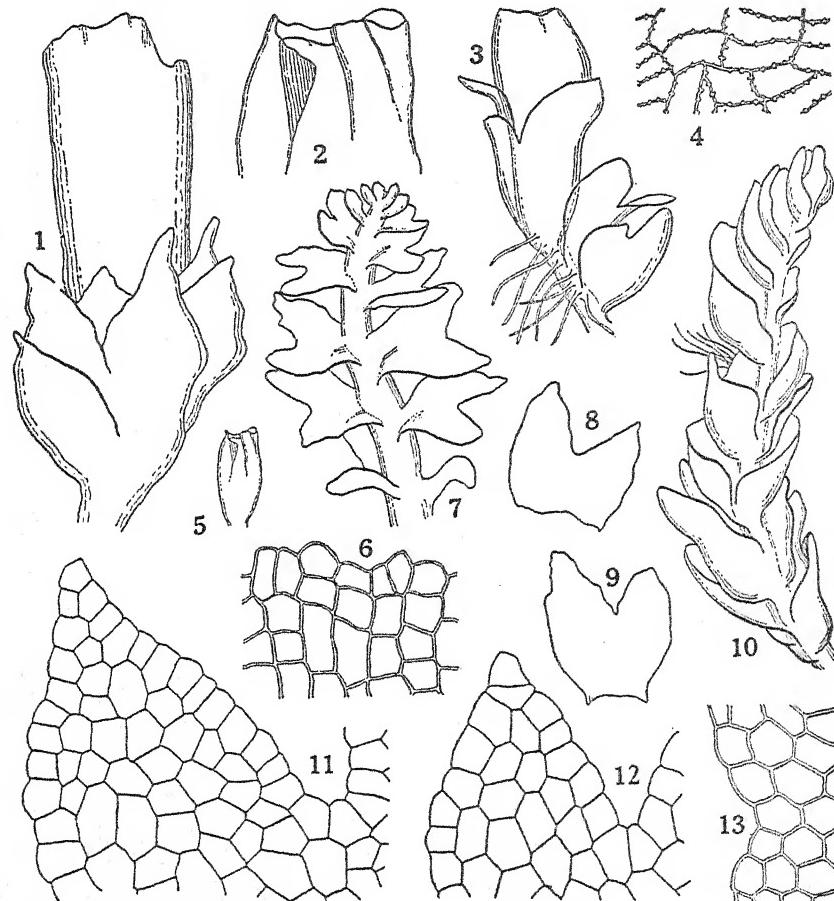
24. *Cephaloziella floridæ*¹⁸⁹ Douin, Bull. Soc. Bot. France 28:312, 1916.

Plants prostrate in a thin layer on rotten wood, brownish green or somewhat reddish brown; leafy shoots 300-700 μ wide. Stems 0.4-1.5 mm long, 35-75 μ thick, prostrate or the tips ascending; branches common, arising ventrally; flagella present, with small but normally formed leaves; surface cells 10-14 μ wide, 10-27 μ long. Rhizoids numerous, colorless, not very long. Leaves alternate, distinctly succubous, not decurrent, distant, spreading, simply 2-lobed, roundly ovate, or through the spreading of the lobes quadrate or obovate, smooth on the back, gradually larger on female shoots, on sterile stems about 85-215 μ long and wide; margin entire; lobes triangular or ovate-triangular, 4-10 cells wide at base but commonly 6-8, acute to rounded but usually obtuse; sinus descending $\frac{2}{3}$ - $\frac{1}{2}$ the leaf

¹⁸⁸ än güst' i 16' bå.

¹⁸⁹ flör' i dæ.

length, acute to bluntly so. Cells of the leaves 8-20 μ , about the same throughout the leaf, isodiametric or nearly so; walls thin; trigones wanting; cuticle smooth. Gemmae not seen. Underleaves fairly constantly present but mostly reduced to half a dozen cells or fewer. Plant bisexual. Male branch short, with only a few leaves below the bracts; male bracts 10-16, about 135 μ long and wide, distinctly imbricate, quite similar to the leaves but the lobes acute to rounded; antheridium 1. Female inflorescence mostly on main stems but sometimes on unmodified branches;



Cephaloziella floridae. 1, Perianth, x 102. 2, Upper part of perianth, x 75. 3, Tip of shoot with young perianth, x 62. 4, Epidermal cells of the sporangium showing nodular thickenings, x 413. 5, Perianth, x 18. 6, Part of mouth of the perianth, x 440. 7, Tip of vegetative shoot, dorsal view, x 102. 8-9, Leaves, the larger lobe ventral, x 102. 10, Male inflorescence, x 62. 11, Lobe of a large leaf, x 355. 12, Lobe of a small leaf, x 514. 13, Part of margin of leaf, x 440. (All original; 1-10, 13, by Elizabeth Curtis.)

female bracts somewhat larger than the leaves of sterile stems, about 240μ long and wide, 2-lobed, widely acute at tip, entire to sinuate, very like the leaves; bracteole united with the bracts for about half its length. Perianth cylindric, about 700μ long and 250μ in diameter when mature, $\frac{1}{3}$ - $\frac{2}{3}$ -emergent, 1 cell thick to base; its cells in the upper half mostly 1-2 times as long as wide, $10-17 \mu$ wide, $13-26 \mu$ long, toward the base about as wide but $25-35 \mu$ long; mouth slightly lobed, crenulate with projecting cells. Seta of 4 rows of cells, longer than the sporangium. Sporangium ovoid, $245-320 \mu$ long, $175-215 \mu$ thick, dark brown, its wall of 2 layers of cells; epidermal cells rectangular, $8-9 \mu$ wide, $17-20 \mu$ long, nodulose. Elaters $100-140 \mu$ long, $5-6 \mu$ thick, bluntly pointed at both ends; spirals 2, reddish brown. Spores $8-9 \mu$, smooth, reddish brown. Named after the state of Florida, in which it was found.—On rotting trunks of trees.

ILLUSTRATIONS: Douin, Revue Gen. Bot. 28: pl. 17, figs. 80-81; pl. 18, fig. 84, 1916; Douin, Soc. Bot. France, Mem. 29: pl. 2, fig. 47, 1920.

EXAMINATIONS: Fla. Key Largo (McFarlin) undated; Sanford (Rapp 56) 1920.

TYPE LOCALITY: Sanford, Florida (Severin Rapp).

RANGE: Fla. (117.2).

25. *Cephaloziella ludoviciana*¹⁹⁰ Douin, Revue Bryol. 41:8, 1914.

Plants in thin patches, greenish brown to slightly reddish; leafy shoots $200-500 \mu$ wide. Stems 0.5-2 mm long, with numerous branches; epidermal cells 1-2 times as long as wide, $14-23 \mu$ long, $13-20 \mu$ wide; branches ventral in origin, often 1-6 from just below the perianth. Rhizoids scarce, colorless. Leaves alternate, transversely to slightly succumbously inserted, not or but little dorsally decurrent, distant to somewhat imbricate, erect to erect-spreading, simply 2-lobed, circular to broadly ovate or elliptic, smooth on the back, distinctly narrowed at base; margin entire or occasionally the dorsal margin with a single blunt tooth; lobes unequal, the ventral the larger, 4-11 cells wide at base, but usually 4-8, acute to obtuse; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, acute to rounded. Cells of the leaves $7-23 \mu$ but averaging $10-14 \mu$, mostly isodiametric or nearly so, the smaller cells near the tips of the lobes; walls thin; trigones wanting; cuticle smooth. Gemmae unknown. Underleaves mostly rudimentary to sometimes well developed, often not present throughout, the larger ones sometimes 2-lobed. Plants bisexual.¹⁹¹ Male inflorescence on separate branch below the female, not seen by us. Female inflorescence on a short large-leaved ventral branch; bracts 3-4 times as long as the leaves of sterile stems, broadly elliptic to ovate, 2-lobed for $\frac{1}{10}-\frac{1}{8}$ their

¹⁹⁰ lü" dō yǐ kí s' nā.

¹⁹¹ According to Douin in original description.

length, the margin entire or merely crenulate by bulging cells, the lobes rounded to acute, the sinus acute; bracteole not lobed or 2-lobed, united with the bracts for $\frac{2}{3}$ its length. Perianth little or not at all plicate, not contracted at tip, the epidermal cells short to little elongate. Mature sporophyte unknown. The name from L. *Ludovicus*, Louis; hence *Ludovicia*, the Latin for Louisiana, in which state the plant was first found.—On the bark of trees.

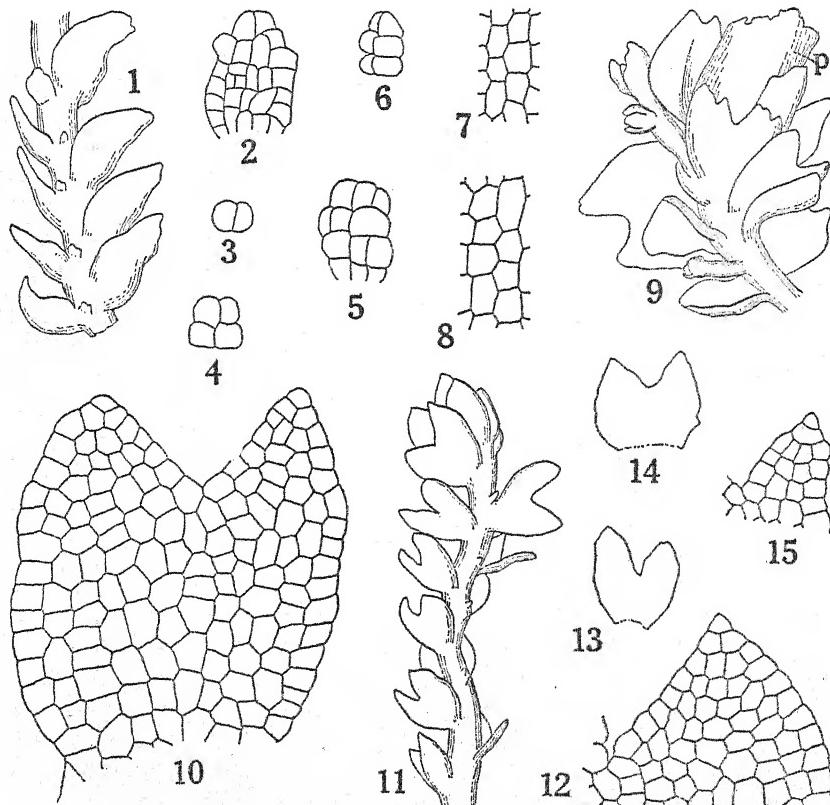
ILLUSTRATIONS: None.

EXAMINATIONS: La. Martinsville (A. B. Langlois) 1888.

TYPE LOCALITY: "Louisiane, leg. Langlois, ex herb. Cardot." Probably the collection by A. B. Langlois on bark of *Melia azedarach* at Martinsville, Louisiana, February 20, 1888. The common name of this *Melia* is China-tree or China-berry.

RANGE: La. (117.2).

Douin (117.2) says it is perhaps the xerophytic form of *C. floridæ*.

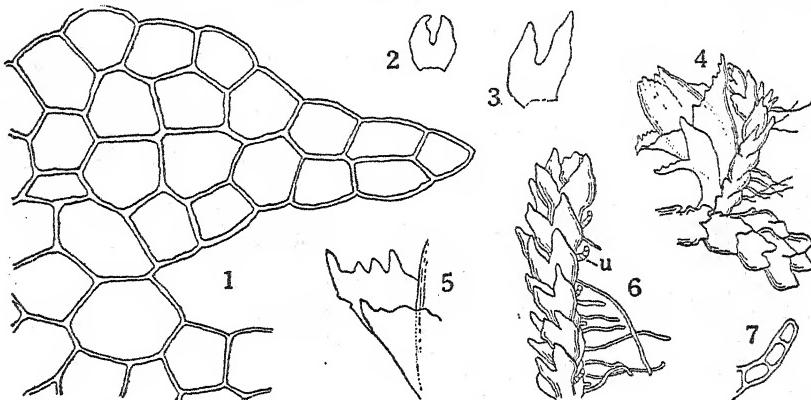


Cephaloziella ludoviciana. 1, Male shoot, ventral view, x 50. 2-6, Underleaves, x 293. 7-8, Surface view of epidermal cells of stem, x 222. 9, Female tip with part of perianth (p) and 2 rejuvenations, x 50. 10, Leaf, the ventral lobe the larger, x 293. 11, Sterile shoot, latero-ventral view, x 50. 12, Lobe of large leaf, x 222. 13-14, Leaves, x 168. 15, Lobe of small leaf, x 222. (All original; 1, 9, 11, 13-14, by Elizabeth Curtis.)

26. *Cephaloziella rappii*¹⁹² Douin, Soc. Bot. France, Mem. 29:77, 1920.

Cephaloziella rappii Steph. Sp. Hep. 6:439, 1924.

Plants in dense patches, dark green to reddish brown; sterile leafy shoots 200-250 μ wide. Stems 0.5-1 cm long, 35-75 μ in diameter, flaccid, irregularly branched, occasionally with innovations beneath the perianth. Rhizoids numerous, long, colorless, present to near the tip of the stem. Leaves alternate, transversely to slightly succubously inserted, not decurrent, distant to contiguous on sterile stem, imbricate near the perianth, erect-spreading, simply 2-lobed, obovate, smooth on back; those of sterile stems 140-330 μ long, 125-250 μ wide, symmetric, slightly concave, with wide insertion; margin entire or rarely with a tooth at base, or bract-like



Cephaloziella rappii. 1, Part of leaf showing one lobe, x 514. 2-3, Leaves, x 62. 4, Tip of plant showing female branch and a sterile branch, x 102. 5, Female bract, x 91. 6, Part of a plant showing underleaves (u), x 62. 7, Underleaf, x 242. (All original; 2-7, by Elizabeth Curtis.)

leaves below the female bracts crenulate by occasional distinctly projecting cells; lobes commonly 2-5 cells wide, lanceolate, acute, slightly divergent; sinus descending $\frac{2}{3}$ - $\frac{4}{5}$ the leaf length, acute or obtuse. Cells of the leaf lobes 18-22 μ , of the basal region 18-27 μ ; walls moderately thick; trigones small or wanting. Gemmae not known. Underleaves common but not present throughout on all plants, larger near the perianth. Plants bisexual. Male inflorescence on separate branch below the female; male bracts entire. Female inflorescence often on a ventral branch; female bracts larger than the leaves of sterile shoots, 2-lobed for $\frac{1}{3}$ - $\frac{1}{2}$ the length; the lobes of the same bract somewhat overlapping each other, narrow, coarsely crenulate by projecting cells, 4-10 cells wide, setose at tip; bracteole as long as the bracts, united with the bracts for about $\frac{2}{3}$ its length, 2-lobed for about $\frac{1}{2}$ its length, its lobes regularly crenulate by

¹⁹² rāp' pi.

projecting cells, its sinus acute to obtuse. Perianth clavate to obovoid, large for the plant, 1-1.7 mm long, 460-750 μ wide, about $\frac{2}{3}$ -emergent, 1 layer of cells thick to base, rounded to the mouth, decolorate for about $\frac{1}{5}$ its length, the ventral ridge only slightly developed; cells of the perianth 8-16 μ wide, 1-2 times as long as wide, the larger cells below the middle; mouth irregularly lobed, the lobes somewhat crenulate by projecting cells. Sporophyte unknown. Named in honor of Severin Rapp, who first gathered it.—On ground; on trunks of trees.

ILLUSTRATIONS: None.

EXAMINATIONS: Fla. Sanford (S. Rapp 60) 1917.

TYPE LOCALITY: Sanford, Florida (Severin Rapp).

RANGE: Fla. (521.05); Bermuda (521.05).

PRIONOLOBUS¹⁰² Spruce, Trans. Bot. Soc. Edinburgh 15:508, 1885.

Jungermannia Hook. Brit. Jung. (Introduction), 1816, in small part.

Anthelia Dum. Rec. d'Obs. 18, 1835, in small part.

Cephalosia Lindb., Jour. Linn. Soc. London 13:191, 1873, in part.

Cephaloziella subgenus *Prionolobus* K. Muell., Rabenh. Krypt.-Fl. 2:186, 1913, in part.

Plants pale green to yellowish brown or reddish brown. Stems prostrate, with ascending tips; branches few, lateral or rarely ventral; epidermal cells rather pellucid. Rhizoids colorless. Leaves alternate, transversely inserted but succubous rather than incubous, not decurrent, simply 2-lobed, margins strongly dentate; lobes equal or the ventral the wider. Cells of the leaf quite thickly walled; trigones none to small; cuticle smooth. Gemmae angular, 1-celled or occasionally 2-celled. Underleaves wanting or quite rare except in the female inflorescence. Plants bisexual or unisexual. Male inflorescence terminal or intercalary; male bracts much like the leaves but sometimes a little larger; antheridium 1. Female inflorescence usually on an unmodified and moderately elongate branch; female bracts with 2-3 acute dentate lobes, often united with each other and with the bracteole; bracteole distinctly larger than the leaves, unlobed or 2-lobed, spinose-dentate, united with one or both bracts. Perianth cylindric or longly ellipsoid, 5-plicate to near base, 1-2 cells thick, roundedly narrowed to mouth; mouth not tubular. Seta elongate. Sporangium exserted. The name from Gk. *prion*, a saw, and *lobos*, a lobe; in reference to the commonly coarsely dentate lobes of the leaves.

¹⁰² priō bō nōl' ū būs.

1. *Prionolobus turneri*¹⁹⁴ (Hook.) Spruce, Trans. Bot. Soc. Edinburgh 15:508, 1885.

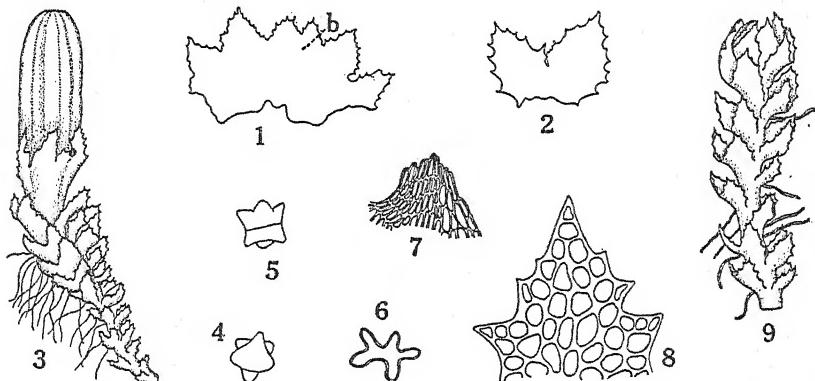
Jungermannia turneri Hook. Brit. Jung. pl. 29, 1816.

Anthelia turneri Dum. Rec. d'Obs. 18, 1835.

Cephalosia turneri Lindb., Jour. Linn. Soc. London 13:151, 1873.

Cephaloziella turneri K. Muell., Rabenh. Krypt.-Fl. 6(2):202, 1895.

Plants in patches or creeping among mosses, pale green to reddish brown; leafy shoots about $400\ \mu$ wide. Stems 2-7 mm long, flexuose, prostrate, ascending at tip, terete, 60-100 μ thick, cortical cells rather pellucid; branches few, lateral or rarely ventral. Rhizoids rather few to many, colorless, present to tip of stem. Leaves alternate, transversely inserted, not decurrent, distant to imbricate, erect to spreading, simply 2-lobed but quite roundly concave, somewhat quadrate when flattened out, about 250 μ long and 200 μ wide; margin all around acutely and unequally serrate-dentate; lobes triangular-ovate to ovate-lanceolate, 12-14 cells



Prionolobus turneri. 1, Female bracts and bracteole (*b*), x 32. 2, Leaf, x 42. 3, Shoot with perianth, x 32. 4-5, Gemmae, x 500. 6, Cross section of perianth, x 18.5. 7, Part of mouth of perianth, x 79. 8, Cells of leaf tip, x 201. 9, Sterile shoot, dorsal view, x 42. (4-5, after Douin; the others after K. Mueller.)

wide at base, unequal, the ventral the larger; dorsal lobe erect and somewhat incurved, mostly in a horizontal plane, acute to apiculate; ventral lobe wider than the dorsal one, spreading, slightly incurved, acute; sinus descending $1\frac{1}{2}$ - $3\frac{1}{4}$ the leaf length, acute. Cells of the leaf middle 12-20 μ , quadrate-polygonal; walls strongly thickened especially near the angles; trigones none or small; cuticle smooth. Gemmae at the tip of the stem, usually scarce, 3-4-angled to stellate, usually 1-celled. Underleaves wanting or very rarely one found. Plants bisexual or unisexual. Male inflorescence near the middle of the branches or terminal; male bracts several pairs, imbricate, resembling the leaves but more concave and sometimes

¹⁹⁴ tūrn' ēr. I.

a little larger; antheridium 1. Female inflorescence terminal usually on a normal branch; female bracts almost twice as large as the leaves, united with each other for $\frac{1}{2}$ - $\frac{4}{5}$ their length, and with the bracteole along one or both its margins; its lobes 2 or rarely 3, broadly ovate, coarsely dentate at margin, acute to acuminate; its sinus about $\frac{1}{3}$ - $\frac{1}{2}$ the length; bracteole united with both bracts or sometimes with only one, ovate, not lobed or 2-lobed, acute or acuminate, spinose-dentate. Perianth cylindric to ellipsoid, about 1 mm long, 250-350 μ wide, 5-plicate to base, one cell thick or in the base of the grooves sometimes 2 cells thick, often decolored near tip, $\frac{2}{5}$ - $\frac{3}{5}$ -emergent, but little contracted to mouth; mouth not tubular, denticulate or obscurely ciliolate. Seta 2-3 mm long. Sporangium oblong-ovoid, exserted, 350-400 μ long, about 220 μ thick. Elaters about 8 μ thick, loosely wound. Spores about 8 μ . Named in honor of Dawson Turner, an English banker and a friend of Hooker.—In shady places, on sandy or loamy banks, in shade of bushes, on rocky banks, on soil.

ILLUSTRATIONS: Hooker (285) pl. 29; Ekart (124) pl. 9, fig. 69; Pearson (433) 2: pl. 74; Gil (76) fig. 273; Macvicar (374) 296, figs. 1-5; K. Mueller (409) 2: fig. 60; Douin, Soc. Bot. France, Mem. 29: pl. 2, fig. 22; pl. 3, figs. 3, 12-13, 1920; Douin, Bull. Soc. Bot. France 60: pl. 12, figs. 18-23, 1913.

EXAMINATIONS: Cal. Mill Valley in Marin County (Howe 174) 1896.—Ore. Newport (Daugherty) 1920.—Wash. Lake Merrill in Cowlitz County (Rakestraw) 1936; Mt. Rainier (Piper) 1895; Pacific Beach (Foster) 1911.

TYPE LOCALITY: Near Bantry, Ireland (Miss Hutchins).

RANGE: Wash. (81), Ore. (457), Cal. (84.1); Eur. (374); Canary Islands (226); Madeira (56.58); Azores (56.58); Africa (226).

According to Stephani (Sp. Hep. 3:342, 1908) Holzinger reported it from British Columbia. We have not found this report. K. Mueller (Rabenh. Krypt.-Fl. 6(2):204, 1913) thinks the report is an error. Since it is now known to occur in Oregon and Washington as well as in California, its occurrence in British Columbia is very probable.

DICHITON¹⁰⁵ Mont. Syll. Crypt. 52, 1856.

Lophoziaella Douin, Bull. Soc. Bot. France 60:492, 1913.

Plants in patches, yellowish green to reddish brown. Stems 1-5 mm long, prostrate, not or little branched. Rhizoids numerous, long, colorless. Leaves alternate, transversely inserted, not decurrent, simply 2-lobed, entire or somewhat sinuate, without dorsal papillae or rarely a few at the insertion, larger near the perianth; lobes sometimes unequal, 3-8 cells wide at base, on sterile branches mostly divaricate; sinus descending $\frac{1}{2}$ - $\frac{2}{3}$ the leaf length, acute to obtuse or rounded. Cells rather small, 13-25 μ ; walls thin or only slightly thickened; trigones none or at most minute; cuticle smooth. Gemmae rare, angular, with 4-6 points, of 2 equal cells. Underleaves wanting on sterile stems, present near the perianth and sometimes near the tip of the stem, without cellular surface papillae.

¹⁰⁵ dī' kī tōn.

Plants bisexual. Male inflorescence the whole or part of a short branch; male bracts 2-lobed; antheridia 1 per bract. Female inflorescence terminal on a main shoot; female bracts united with the bracteole for practically the whole length, the whorl thus making an involucral cup around the perianth. Perianth cylindric to somewhat pyriform, $\frac{2}{5}$ - $\frac{1}{2}$ -emergent, 3-5-plicate toward mouth; mouth almost as wide as the perianth, slightly crenulate with bulging cells and sometimes lobed. Seta of 4 rows of cells. Sporangium ovoid-globose. Elaters with 2 spirals. Spores 6-9 μ , granulate or papillate. The name from Gk. *di*, double, and *chiton*, a mantle; in reference to the united female bracts and bracteole constituting an involucre which resembles a second perianth.

1. *Dichiton integerrimum*¹⁹⁸ (Lindb.) Buch., Ann. Bryologici 10(1937):3, 1938.

Cephalozia integerrima Lindb., Acta Soc. Sci. Fennica 10:502, 1875.

Cephalozia (subgenus *Cephaloziella*) *integerrima* Spruce, On Cephalozia 66, 1882.

Cephaloziella integerrima Warnst. Krypt.-Fl. Mark Brandenburg 1:232, 1902.

Cephaloziella piriflora Douin Musc. d'Eure et Loire 262, 1906.

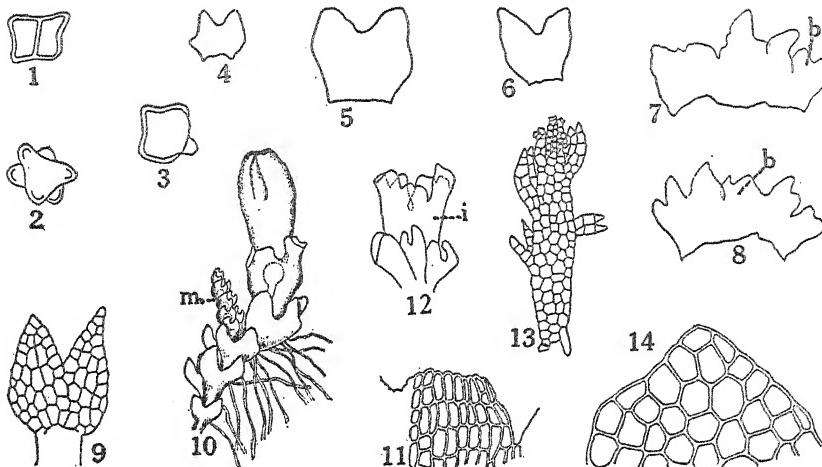
Lophozia integerrima var. *piriflora* Douin, Bull. Soc. Bot. France 60:478, 1913.

Lophozia piriflora Douin, Bull. Soc. Bot. France 60:486, 1913.

Lophozia integerrima Douin, Bull. Soc. Bot. France 60:488, 1913.

Plants in thin patches, green or light green to reddish brown. Stems 1-5 mm long, prostrate, flexuous; branches few, lateral, short. Rhizoids numerous, long. Leaves alternate, transversely inserted, not decurrent, spreading, simply 2-lobed, roundish to subquadrate or cuneate, wider than the stem, those of the sterile stems distant, those near the female bracts contiguous and larger; margins entire, or at most sinuate; lobes triangular to ovate, often somewhat divaricate, mostly obtuse, occasional ones rounded or acute, 6-7 cells wide at base; sinus descending $\frac{1}{3}$ - $\frac{1}{2}$ the leaf length, acute to obtuse or rounded. Cells 14-25 μ , much the same in various parts of the leaf, polygonal; walls thin; trigones wanting or minute; cuticle smooth. Gemmae rather rare, angular, with 4-6 points, 2-celled, 15-18 μ . Underleaves wanting on sterile stems to present only near the tips. Plant bisexual. Male inflorescence constituting the whole or a part of a lateral branch below the female inflorescence; male bracts smaller than the adjacent leaves, imbricate, 2-lobed, roundish, quite concave, with a blunt tooth on the dorsal margin, the lobes obtuse. Female inflorescence terminal on a main stem or large branch; female bracts much larger than the leaves, irregularly 2-3-lobed, the lobes entire or rarely slightly toothed, obtuse to rounded; bracteole united for its whole length with the bracts to form a cup around the base of the perianth, somewhat smaller than the bracts, 2-lobed or rarely 3-lobed; the cup irregularly 7-9-lobed for $\frac{1}{4}$ - $\frac{1}{3}$ its length, loosely fitting the perianth, its lobes

¹⁹⁸ in tē jēr' rī mūm.



Dichiton integerrimum. 1-3, Gemmae, x 356. 4, Male bract, x 30. 5-6, Leaves, x 30. 7-8, Female bracts and bracteoles (*b*), x 12.7. 9, Leaf, x 72. 10, Tip with perianth and male (*m*) branch, x 12.7. 11, Part of mouth of perianth, x 93. 12, Involucre (*i*) and first leaves below it, x 10.6. 13, Very young shoot forming gemmae at tip, x 178. 14, Leaf cells, x 169. (1-3, 12-13, after Douin; 9, after Jensen; the others after K. Mueller.)

rounded and entire. Perianth cylindric to somewhat pear-shaped, about 1 mm long, about $\frac{1}{2}$ -emergent, irregularly 3-4-plicate in the upper half, hyaline toward tip, only slightly narrowed to mouth; mouth with several wide truncate lobes, its marginal cells somewhat bulging, or rarely the lobes obscurely denticulate.¹⁹⁷ Sporangium ovoid-globose. Spores 6-8 μ , finely granulate, reddish brown. The name the L. *integerrimus*, most entire; in reference to the margins of the female bracts, which are lobed but not toothed.—On damp, sandy ground.

ILLUSTRATIONS: K. Mueller (409) 2: fig. 48; Macvicar (374) 297, figs. 1-5; Warnstorf (523) 235, fig. 8; Douin, Bull. Soc. Bot. France 60: pl. 12, figs. 15-17, 35, 1913; Jensen (323.5) 215, 2 figs.

EXAMINATIONS: None.

TYPE LOCALITY: On an island in Lake Ladoga, Russia (Lindberg) 1874.

RANGE: N. Amer.¹⁹⁸ (270.1 and 56.55); Eur. (409).

¹⁹⁷ Jensen (323.5) 215, fig. 3 of *Lophozia integerrima* shows the cells of the mouth of the perianth quite different from K. Mueller (409) in their arrangement.

¹⁹⁸ We do not know where in North America the species has been found.

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